START

003811

Review and Comments on the RI/FS Work Plan
for the 300-FF-5 Operable Unit

Commentor Codes: IT = International Technology, RL = Richland Operations, HAZWRAP = DOE/HQ-DP contractor, NUS = DOE/HQ-E&H contractor, OCC = Office of Chief Council - RL,

1. General Comment: One of the major reasons for preparing the FF-5 Work Plan as a separate entity was to assure that the total, reviewed data available to PNL would be incorporated into the revised plan. The references do not include recently cleared quarterly RCRA monitoring reports and the data are the same as those presented in the FF-1 Work Plan. Evidence is weak that the objections to the previous Work Plan were taken into account in writing this document.
RL

Response: Accept. Many of the data are the same. There have been no major new revelations since the 300-FF-1 report was prepared. The 300-FF-5 report does present the data in a different manner in an attempt to demonstrate that the plumes detected are not stationary but vary with time. They come and go with some notable exceptions--uranium, chloroform, and nitrate.

2. General Comment: It is not possible to evaluate actions which are not described in this document, but reference the 300-FF-1 Project Plan. One example is the Project Management Plan, Attachment 3. Cost, key assumptions, schedule, and personnel specific to the 300-FF-5 area should be addressed as part of this RI/FS work plan.
NUS

Response: Reject. This report is written as an addendum to 300-FF-1 and duplicate sections will not be repeated.

3. General Comment: During disposition of groundwater related comments to the FF-1 Work Plan, numerous comments were deferred to the then to be written FF-5 Work Plan. A cross-walk between those comments and their handling in this plan is needed. Several of the comments to this plan are the result of attempts to accomplish this cross-walk. Please provide such a cross-walk as an aid to agency reviewers, it will make life easier for all concerned.
IT

Response: Agree with concept. The EPA and DOE comments on 300-FF-1 and deferred to 300-FF-5 will be dispositioned in this review cycle. Many of the comments have already been eliminated in the current draft.

4. General Comment: At this time there is no assurance that the FF-5 RI/FS will be conducted by PNL. Therefore, direct references to PNL conducting the work should be removed.
RL

Response: Agree. Text will be revised throughout to show that WHC has the lead for all environmental restoration work.

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5. General Comment: Several sets of figures, water table contours, surface water sampling locations and the plume maps are drawn to different scales. This problem with scale does not permit the reader to make comparisons of data without extreme effort. Change the figures to a common scale.
IT

Response: Accept intent, reject fix. The figures have been prepared at a scale that best presents the features of the area of interest.

6. General Comment: The figures in this work plan have been improved by making the data on individual plume maps time equivalent, however, the spectrum of plume maps is anything but time equivalent. It is unclear as to why this approach was taken. Normal practice would dictate that the maps would be presented to show the distribution of contaminants at a single instant in time and additional maps would be used to show the influence of a changing environment.
IT

Response: The plume maps are not all time equivalent because the maximum concentrations of constituents do not occur at the same time. Some contaminants such as chloroform have a seasonal high. Others have historic highs that have declined to very low levels, which makes it difficult to draw meaningful contour maps using very recent data. The plumes with common constituents from more than one source are only distinguishable during certain sampling periods.

7. GENERAL: Source investigations for 300-FF-1, 300-FF-2 and 300-FF-3 should be done first or concurrently with the 300-FF-5 RI/FS rather than completing separate source investigations during the 300-FF-5 RI. This will allow optimization of well locations, etc.
IT

Response: Agree. There is no intent to conduct detailed source term investigation in 300-FF-5. Some soil gas work is planned in the 300-FF-2 area because of possible releases to the groundwater. It would be nice to do the source work first; this is a DOE-RL/WHC decision.

8. GENERAL: 300-FF-5 RI/FS should not deal with vadose material except as related to source areas in surface operable units.
IT

Response: Disagree. The continuity of geologic data from ground surface through the entire stratigraphic column is important in developing an understanding of the strata. If vadose zone contamination

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is encountered during monitoring well installation, it must be investigated at the time, not left to another study.

9. GENERAL: It would be easier to determine well locations with features of OUs if the same coordinate grid was used on both.
IT

Response: Agree, but the entire area could not be presented on a single sheet with that kind of detail unless a large sheet format was used.

10. GENERAL: Although a reference section is shown as Section 8, pp. WP-198 through WP-208, it is not clear which documents are being invoked as standards, policy, or requirements on which the work plan is based. This section appears to be a bibliography from which some data provided in the plan are attributed (i.e., the sources of the data). It is recommended for all the plans that:

a. The standards, policies, requirements, or laws being invoked or complied with be included in or near the introduction as a "Reference" paragraph to make it clear which are the applicable compliance documents from the standpoint of the elements to be controlled and the work to be accomplished;

Response: Agree. This has been done in Section 1.0 and throughout the report.

b. Relevant Environmental Protection Agency (EPA) documents be identified;

Response: Agree. This has been done in Section 1.1.

c. The references be numbered and identified in the text by a discrete reference number. As presented, it is not clear which document is being referenced in the text.
HAZWRAP

Response: Disagree. The format used clearly identifies documents referenced, unless a mistake is made. The format used is a standard format.

11. GENERAL: Sections 3.3 and 5.3.9: The discussions on the "Potential Impacts To Public Health and The Environment" and "Baseline Risk Assessment" are well written and cover all the pertinent areas for a work plan.
HAZWRAP

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Response: Accept. No resolution required.

12. GENERAL: When using "--" in tables please define.
HAZWRAP

Response: Agree. Tables will be modified.

13. As with previous work plans, please provide a list of acronyms and abbreviations following the list of tables.
IT, HAZWRAP

Response: Reject. The use of acronyms has been kept to a minimum and only the more common ones have been used in the report. Standard (or WHC format) abbreviations have also been used.

14. WP-1, Sec 1.0, p. 2: If a different contractor implements project plan FF-5 the implements FF-1, then the contractor must comply with not only the requirements of FF-5, but also those of the FF-1, since 5 is an addendum to 1. In other words, the QAPP as written in FF-5, based on PNL performing the work would result in PNL also having to comply with the QAPP in FF-1 which may be written based on WHC's QA program.
RL

Response: Agree. The plan will be revised to indicate that WHC has the lead for the project; the same as for the 300-FF-1 operable unit.

15. WP-1, Section 1.0, P. 1: "...CERCLA is the guiding regulation..." CERCLA is not a regulation. Please fix.
IT

Response: Agree. Text will be changed to indicate it is a law.

16. WP-1, Section 1.0: List the DOE Orders for which compliance is required, e.g. 5400.1.
IT

Response: Reject. No reference to DOE orders added. The legal framework for cleanup of the Hanford Site is the Tri-Party Agreement, CERCLA, RCRA, the Washington State Hazardous Waste Management Act (HWMA), and regulations promulgated pursuant to CERCLA, RCRA, and HWMA. DOE orders do not have the same legal status as federal and state laws and regulations, are not enforceable in the same manner as federal and state laws and regulations, and are not mentioned in the Tri-Party Agreement.

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17. WP-1, Sec. 1.0, Para. 2: The boundary of the 300-FF-5 O.U. is not well defined and probably varies as the Uranium Plume moves, therefore some other rationale should be used for the boundary. The reason why the uranium plume was chosen for the boundary should be addressed, especially since other O.U.'s may be impacting water quality in the 300-FF-5 unit.
IT

Response: Reject. The operable unit has been defined in WHC-EP-0216, p. 13 and p. 6-3. Reference to this document will be added to the text to indicate this definition was not devised for this plan. This is also stated in Section 2.1.1.

18. WP-1, Section 1.1, P. 2: The last sentence is somewhat misleading in that Stenner et al. was not the PA/SI, although the test scoring documented in Stenner et al. was judged functionally equivalent to the PA/SI. This should be clarified in the text.
IT

Response: Reject. This is a restatement of the first sentence in the "Preface" of the referenced document.

19. WP-2, Figure 1: Should show that both the Site Characterization and Development of Remedial Alternatives results are used to develop the Treatability Study Work Plan, and that the Treatability Screening contributes information to the Treatability Test Evaluation Report.
NUS

Response: Agree. The arrows between the RI and FS were intended to reflect that interaction. The figure will be modified to show that there is interaction, both ways, between the RI and FS.

20. WP-4, Sec 1.1, last para: This section indicates that the project plan was developed in accordance with .... requirements contained in EPA guidance documents and relevant DOE Orders. The document fails to identify those documents and does not appear to comply with DOE Order 5400 or 5700.6B regarding Quality Assurance.
RL

Response: See comment 16. Reference to DOE orders will be deleted. For information purposes, DOE Order 5400 is a series of orders on DOE's environmental protection program and DOE Order 5700.6B is entitled, "Quality Assurance." Section 1.1 is not the place for a long (or short) list of EPA guidance documents, but the following could be included as a partial list at some appropriate point:

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- "Superfund Program; Interim Guidance on Compliance with Other Applicable or Relevant and Appropriate Requirements," 52 FR 32496, August 27, 1987.
- "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," EPA/540/G-89/004, October 1988.
- "CERCLA Compliance with Other Laws Manual, Draft Guidance," OSWER Directive 9234.1-01, August 8, 1988.

21. WP-4, Section 1.2, first bullet: The media for which the nature and extent of contamination are to be determined are listed in the project goals and in Table 28, "Data Quality Objectives". These two lists need to be made consistent, i.e., add aquifer sediments and delete surface water sediments from page WP-4, and add biota to Table 28.
IT

Response: Agree to adding aquifer sediments to page WP-4. Disagree with the remaining recommendations. Table 28 does include surface water sediments and biota.

22. WP-5, P.2: Should explain the procedures to be used to amend the Project Plan: is the plan to be amended and reissued or are amendments to be issued as small reports? Record keeping should be addressed as part of the data management system (DMS).
NUS

Response: Agree. The procedure is documented in the Tri-Party Agreement, page 9-7. This will be referenced in Section 1.3.

23. WP-5, P. 4, line 5: Add "Potential" before "Applicable" or Relevant . . ." At this point in time, ARARs are not being determined.
OCC

Response: Agree. Text will be modified.

24. WP-5, Sec. 1.3, Para. 2: The work plan should be able to stand alone especially with respect to potential sources of groundwater contamination.
IT

Response: Disagree. The approach used to generate this plan was to reference 300-FF-1 as much as possible.

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25. WP-6, Sec. 1.3, P. 5: The community relations plan has been released and is in use for public review of work plans. The specifics of that plan should be addressed and the document number used as a reference.
IT

Response: Agree. The Hanford Community Relations Plan will be referenced in Attachment 5. It currently has no document number.

26. WP-7, Sec. 2.1.1, Para. 1: The rationale for using uranium should be explained. The concentration at which groundwater is considered contaminated needs to be listed, since the unit "background" is about 4.7 mg/l, but Hanford background is N.D.
IT

Response: Agree. The use of the uranium plume is stated as the guide for establishing the area of the 300-FF-5 in the referenced document. This statement has been amended by stating that the ultimate boundary of the operable unit will be determined by the extent of groundwater contamination emanating from 300-FF-1, 300-FF-2, and 300-FF-3.

27. WP-7, Sec 2.1.1: Should include a topographic map of the general site area.
HAZWRAP

Response: Disagree. A topographic map is not important for a subsurface operable unit with an upper boundary at the water table.

28. WP-7, Sec. 2.1.2, Para. 3: The word "few" should be defined as to approximate or exact number and relative locations.
IT

Response: Agree. "Few" will be changed to "two."

29. WP-8, Figure 2: The site area map should include the locations of the 300-IU-1 and 1100-EM-1 sites relative to the 300-FF-5 Operable unit. Also, all other site figures should include the flow direction of the Columbia River.
HAZWRAP

Response: Agree. The two operable units will be added to Figure 2 and arrows showing flow direction of the Columbia River will be added.

30. WP-8, Figure 2: It would be informative to label units (e.g., "south process pond") when they first appear on a map.

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NUS

Response: Disagree. Convention used in this plan is the WIDS number identification.

31. WP-8, Figure 2: On numerous figures (e.g., Figure 2), stippled lines are used, but their purpose is not explained on the map or in the legend. Does it surround the 300 area, or is it the site boundary?
NUS

Response: The line is used to identify boundaries other than for the operable units. It delineates both the Hanford Site boundary and the 300 Area boundary.

32. WP-10, Sec. 2.1, GENERAL: The waste disposal practices of the 300-IU-1 O.U. are discussed, however, no attempt is made to determine groundwater contamination due to this IU-1 O.U. The waste process of 300-IU-1 should be deleted from this work plan. Also, a more detailed discussion of the 300-FF-1 process trenches, the recent RCRA monitoring performed for the trenches and the closure schedule is needed. This is sufficiently important that it should not just be referenced to the 300-FF-1 work plan.
IT

Response: The purpose for including 300-IU-1 in the plan was to identify potential sources of contamination entering the 300-FF-5 operable unit from the north to help in determining background conditions for the 300-FF-5 operable unit. Actually assessing groundwater contamination resulting from the 300-IU-1 is beyond the scope of this RI/FS. The more detailed discussion of 300-FF-1 is referenced rather than repeated because this Work Plan is an addendum to the more detailed discussion.

33. WP-11: The discussion of the interaction of 300-FF-5 with units FF-1, -2, and -3 should include a more detailed description; not just a list of units overlying FF-5, but also potential/probable/known contamination.
NUS

Response: Contaminants disposed or located in the various waste units are listed in the 300-FF-1 Work Plan. Additional potential contaminants are listed in Section 3.1, "Known and Potential Contamination," of this Work Plan; also in this section is a summary of known existing contamination in the 300-FF-5 operable unit. Information pertaining to what specific waste units contributed to this contamination is not available. This information will be generated during the RI/FSs of the source operable units.

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34. WP-11, Sec. 2.1.4, GENERAL: A table is needed for the reader summarizing the waste storage, transfer, treatment and disposal facility characteristics of the 300-FF-1 O.U.
IT

Response: Disagree. See response to comment 32.

35. WP-11, Section 2.1.3, P. 1: The first sentence of this paragraph is very confusing probably because of numerous grammatical errors. Please fix.
IT

Response: The sentence will be replaced with the following: "An unplanned release in the 300-FF-3 operable unit and a waste unit in the 300-IU-1 operable unit received waste from operations relating to the development of the REDOX (reduction-oxidation) and PUREX (plutonium-uranium extraction) processes. (These processes were used to separate plutonium from fission products, uranium, and other transuranics in irradiated fuel.)

36. WP-11, Section 2.1.4, P. 2: Since 300-FF-4, the Horn Rapids Landfill, and 200-PO-2 are stated in Section 2.1.1 as having a possible effect on 300-FF-5 groundwater, it seems for completeness sake that these facilities should also be addressed here and perhaps shown on a map such that one could visualize the spatial relationships of these more remote facilities to 300-FF-5. This would certainly aid in understanding the rationale for placement of monitoring wells.
IT

Response: Disagree. The key is that these are more remote facilities and are mentioned only for completeness. No additional detail is necessary. These units will be placed on one of the existing figures.

37. WP-11, Sec. 2.1.5, Para. 1: The locations of the other O.U.'s which may impact groundwater quality at 300-FF-5 should be shown on a figure.
IT

Response: See response to comment 36.

38. WP-11, Sec. 2.1.5, Para. 1: There will be no way to deduce from this RI/FS which of these other O.U.'s is responsible if any contamination is detected entering the 300-FF-5 O.U.
IT

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Response: The last sentence of this paragraph will be changed to: "The location of these operable units will be used to determine locations of wells to assess background concentrations."

39. WP-11, Sec. 2.1.5, P. 2, line 5: Change "discharging into" to "entering" to clarify that this is not a discrete discharge.
OCC

Response: Agree. Text will be modified.

40. WP-12 to WP-26, Tables 2, 3, & 4: Headings for the amounts of materials disposed of in units. This information is important, and should be provided. Units should be briefly described in the tables, including information on size and materials of construction (e.g., "10,000 gallon steel storage tank, single-wall"; type of "equipment"; and "100 square foot" or "10 acre" landfill).
NUS

Response: Agree. This additional information will be added to the table. Because of the extensive nature of this effort, the table will be modified with the requested information in a later draft.

41. WP-12: Text should discuss the units shown on maps (by number) and in Table 2.
NUS

Response: A reference is given where additional information on the various waste units can be obtained. Information pertaining to the exact effects these units have on the 300-FF-5 operable unit has not been developed.

42. WP-14, Table 3: These units should be included on all figures, not just Fig. 5.
IT

Response: Disagree. All of these units cannot be included on all figures because the figures would be too cluttered.

43. WP-18, Table 3: With reference to the 303-M Uranium Oxide Facility; Under waste type and amount, the process is referred to as "incineration." WHC recently advised in relation to another matter that "calcination" is the more appropriate term. Please verify which process description is correct.
OCC

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Response: Accept. The word "incineration" will be replaced with "calcination."

44. WP-26, Table 4: Under Waste Types and Amounts, the third line says the berm material was "burned." Is that correct or was "buried" intended?
OCC

Response: The word will be changed from "burned" to "buried."

45. WP-29, Section , Figure 6: The figure identifies waste management units within 300-IU-1 that are not listed in Table 4, e.g., UPR-600-1. Please explain the reason for the different information provided.
IT

Response: The additional waste units shown in Figure 6 were included as part of the 618-10 waste site in the Operable Units Report published by WHC.

46. WP-30, Sec. 2.16, Para. 1: Describe the current monitoring and closure plans for the 316-5 process trenches. Since the proposed RI/FS investigations should consider these items, it is not sufficient to merely reference Schalla et al. (1988).
IT

Response: Agree. There are no current closure plans in place. Will add the following sentence at the end of paragraph 1: "Present scheduling calls for submission of closure plans for the 316-5 process trenches by the end of September, 1992."

47. WP-30, Sec 2.2.2: The first sentence should read "The generalized stratigraphy of the 300-FF-5. . ."
HAZWRAP

Response: Accept. Text will be modified.

48. WP-31, Figure 7: The water table is not indicated in the figure although the symbol is shown in the legend.
IT, HAZWRAP

Response: Accept intent. It is shown but doesn't stand out. The figure will be modified to make water table stand out.

49. WP-32, Sec 2.2.2.2: The age of the Ringold Formation or the age of each sequence should be included.
HAZWRAP

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Response: Accept. The following sentence will be added: "The Ringold Formation in the Pasco Basin ranges in age from >3.9-8.5 million years (DOE 1988)."

50. WP-33, Figure 8: The location indicated by the locator map is unclear; it would be clearer if a larger area were shown; and also if the process trenches were labeled with the number used on most of the other maps.
NUS

Response: Accept. Location map will be redrawn to be like base map used in other figures.

51. WP-34, Sec. 2.2.2.3, Para. 2: This remnant may be an important feature. A more detailed discussion of why it is thought this may restrict groundwater flow (i.e., present evidence) is needed. It is not clear from the water table maps (which are inadequate) that any observed effects are due to the remnant as opposed to process and sanitary trench activities.
IT

Response: Agree. Add at end of Para. 2: "This erosional remnant is important and needs better definition in location and extent. It may form an hydraulic barrier, or partial barrier, to water flow between the 300 Area and the Columbia River; or, because there are indications that breaches may occur in the remnant, water flow could be selectively channeled to the river."

52. WP-36, Sec. 2.2.3, P. 1, Sent. 1: Based on statements in this section of the plan, one would be led to believe that the unconfined aquifers on the opposing banks of the Columbia River are hydrologically separated and therefore can be considered as separate entities. Maps provided in this and earlier plans show that the flow of groundwater in the unconfined aquifer is generally toward the Columbia River. Please explain how any significant recharge to the unconfined aquifer of the Hanford Site can occur to the north of the site, or better yet, delete the statement.
IT

Response: Agree. The first paragraph will be deleted and replaced with: "Some natural recharge to the unconfined aquifer may occur from precipitation on higher elevations in the western part of the Hanford Site. Other sources of recharge are infiltration from small ephemeral streams and water from the Columbia and Yakima Rivers along influent reaches. Artificial recharge to the unconfined aquifer occurs from discharges of large volumes of cooling and process water on the Hanford Site, presently in and near the 200 and 300 Areas. Local recharge to the upper basalt aquifers is believed to be from precipitation and

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runoff along the margins of the Pasco Basin. Discharge of water from the unconfined and upper confined aquifers is to, and along, the Columbia River."

53. WP-36, Sec. 2.2.3.1, Para. 1: The statement is made that the "uppermost aquifer of the Saddle Mountains Basalt . . . is hydraulically isolated from the unconfined aquifer". This means groundwater could not flow from the confined to the unconfined aquifer as is described in section 2.2.3.1, paragraph 2, i.e., groundwater flows from the basalt aquifers into the overlying sediments.
IT

Response: See response to comment 54.

54. WP-36, Sec. 2.2.3.1, P. 1 & 2: As these two paragraphs stand, they are contradictory. Some additional explanation is needed to provide the hydrologic reasoning for the statements made on the isolation of the two aquifer systems. To the uninitiated reader, confusion will reign.
IT

Response: These two comments are treated together. Agree that further explanation is needed. Will change paragraph 1, second sentence, beginning "In the context of this 300-FF-5 Project Plan, 'confined aquifer'...", and paragraph 2, to read: "In the context of this 300-FF-5 Project Plan, "confined aquifer" is used to designate the uppermost aquifer of the Saddle Mountains Basalt that underlies the Hanford and Ringold Formations. This aquifer is effectively confined, with increased hydraulic heads, by the lowermost clay facies (M3 unit or layer) of the Ringold Formation. This setting allows the overlying unconfined aquifer to be treated as a separate hydrologic unit in the 300-FF-5 Project area.

The 300 Area is near the axis of the Pasco Basin syncline. This axis location is considered to be the regional sink or discharge area for the confined aquifers, with groundwater flowing upward through the confining layer regionally because of the hydraulic head difference and into the overlying unconfined aquifer. Hydraulic head differences across the confining unit of the Ringold Formation have been measured in the range of 20 to 35 ft, with higher heads below the confining layer indicating a large upward gradient. The rate and volume of flow through the confining layer is probably quite low at a given location, but regionally may contribute to maintaining the water level in the unconfined aquifer and supplying base flow to the Columbia River."

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55. WP-36, Sec 2.2.3.1, P. 2: The last sentence of this paragraph refers to large measured differences in head across the confining zone. The only data presented, Table 9, show generally downward gradients across this zone. Please provide the supporting data for this statement of large upward gradients.
IT

Response: Agree. Table 9 shows only the initial depth to water during drilling, so only the unconfined water level has been reported. Therefore Table 9 will be revised to show the initial water level in the screened interval rather than the first water encountered. In addition, four hydrographs will be prepared that compare water levels in four well clusters (399-1-7 and 1-9, 399-16A and 16B, 399-1-17A and 17C, and 399-1-18A and 18C) to illustrate the differences in water level elevations between the confined and unconfined aquifers.

56. WP-36, Sec. 2.2.3.1, Para. 3: The fact that 339-1-18C is interconnected with the unconfined aquifer should be discussed. It should be discussed as to whether the annular seals or casing are leaking, or the confined and unconfined aquifers are naturally interconnected. The casing could be tested with pneumatic packers.
IT

Response: Agree in part. We agree that the hydraulic and chemical uniqueness of well 1-18C should be explained. The explanation of the natural interconnection or pathway to be added to the work plan will be addressed in Section 3.1.3.2, WP-72. The water chemistry in well 1-18C is equivalent to that found in the confined aquifer, but it is in hydraulic equilibrium with the unconfined aquifer for the reasons presented herein. The following explanation will be inserted on page 67. "Well 1-18C is completed in what would be best described as a unique portion of the unconfined aquifer compared to confined aquifer wells such as 1-17C shown in **Figure (new schematic)**. Like most wells screened in the confined aquifer, well 1-18C is screened below layer M3; however, it is underlain by the Goose Island basalt flow, not the Martindale basalt flow. Apparently, groundwater from the confined aquifer slowly flows from the Martindale basalt upward through the Goose Island basalt and into the gravelly sand above the Goose Island. Because the hydraulic gradient is upward from the Martindale basalt flow, the water chemistry in well 1-18C is the same as well 1-17C. The hydraulic head is lower in 1-18C for two primary reasons: (1) most of the hydraulic head is lost overcoming the resistance to upward flow as the groundwater flows through the dense columnar basalt of the Goose Island layer; (2) layer M3 is not as thick as in most of FF-5 and therefore the remaining confined hydraulic head is lost when the

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hydraulic head in the gravelly sands at well 1-18C equilibrates with the hydraulic head in the unconfined aquifer."

We disagree with testing the casing with pneumatic packers because there is no indication from the well logs or water level data that artificial hydraulic interconnection with the uppermost confined aquifer ever occurred. In fact, our data indicates that the uppermost confined aquifer was never penetrated.

57. WP-36, Sec. 2.2.3.1, P. 4: The discussion of hydraulic parameters is confusing. An alternative that would provide clarity is to present the information in a figure or table.
IT

Response: Agree, will provide table. Will add at the end of paragraph 4, Sec. 2.2.3.1, p. WP-38: "Table ____ (new table added) summarizes the hydraulic properties of the suprabasalt aquifer units and the upper confined aquifer in the 300 Area in comparison with the hydraulic properties of the same units over the Hanford Site in general."

58. WP-36, Sec 2.2.3.1, P. 4: Include a piezometric surface map for the upper confined aquifer. The reviewer should be able to interpret the available data.
IT

Response: Disagree. The four hydrographs prepared in response to comment 55 above do not have time equivalent water level measurements before hydraulic interconnection occurred in well 1-16D; thus lowering the hydraulic head in adjacent well 399-1-16C by 28 ft. Also, these early water level measurements may be accurate to ±1.0 ft, which is not sufficiently accurate for interpreting flow direction. Well 399-1-18C, which receives water from the upper confined aquifer via the Goose Island flow, is only partially hydraulically interconnected with the upper confined aquifer of the Martindale Formation; therefore well 399-1-18C can not be used for interpreting flow direction. This leaves only four confined aquifer wells where confined hydraulic head can be obtained. Currently, only two (399-1-9, 399-1-17C) of these four (the other two wells are 399-4-5 and 399-5-2) are measured routinely. Based on the complexity of flow patterns in the unconfined aquifer, neither two nor four wells would be adequate to provide meaningful interpretation of the flow direction in the upper confined aquifer. This is why 12 additional wells are planned for the upper confined aquifer.

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59. WP-36, Sec. 2.2.3.1, Para. 4 and WP-38, Sec. 2.2.3.2, Para. 3: Transmissivities (T) and hydraulic conductivities (K) are presented separately although they are related by aquifer thickness (b); i.e., T = K x b. This becomes confusing, for example, with K varying over five orders of magnitude (0.01 to 1,000 FT/D) in the Saddle Mountains Basalt and T varying over three orders of magnitude (1.6 to 100 FT^2/D). It would be helpful to discuss either transmissivities or hydraulic conductivities.
IT

Response: Disagree. In cases where values are cited from other references, they are cited as reported to preserve the integrity with the reference quoted. The large variations (several orders of magnitude) in transmissivities and hydraulic conductivities are typical of the values as they are presently known.

60. WP-37, Figure 9: The overlap of wells labeled 1-3, 1-7, 1-8, 1-9, and 1-20 (shown, for example, on Figure 9, page WP-37) is unclear- are they in same borehole, or simply in close proximity to one another?
NUS

Response: Agree. These wells are in very close proximity and 4 partial circles will be added to the whole circle to indicate their closeness.

61. WP-38, Section 2.2.3.2, P. 2 and 3: These two paragraphs contain a great number of statistics which are almost impossible to follow. These two paragraphs should be replaced with a table.
IT

Response: Agree. See response to comment 57.

62. WP-39, Sec. 2.2.3.3, Para. 1: The vadose zone should be discussed since the reader does not know if vadose zone materials in 300-FF-2 and 300-FF-3 are similar or different than 300-FF-1.
IT

Response: Agree with intent; disagree with fix. Will add the following after the first sentence under Sec. 2.2.3.3: "The description of the vadose zone given in the 300-FF-1 Project Plan is considered to be representative of this zone in the 300-FF-5 project area. No reasons or data are known to suggest that the conditions described for 300-FF-1 are discontinuous or different in the 300-FF-5 area."

63. WP-39, Sec. 2.2.3.2, Para. 6: A map showing the suspected location of the paleochannel would be useful.

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IT

Response: Agree that it would be useful, but data at present do not support mapping a location. Will add at the end of Para. 6, following "....the river with steep gradients.": "Lindberg and Bond (1979) suggested that the channel merges with the Columbia River about 2 miles to the north and about 1 mile to the south of the 300 Area."

64. WP-41 to WP-43, Figures 10 to 13: Can the wells in the confined aquifer be used to show groundwater flow direction in the confined aquifer (as shown for unconfined aquifer in figures 10 through 13 (pages WP-41 through WP-43)?
NUS

Response: No. See response to comment 58.

65. WP-41 to WP-43, FIGS. 11, 12, 13: It is essential to have water table contour maps for at least four consecutive quarters, and possibly two sets of four quarters prior to and after discharge reduction at 316-5. There should be sufficient data from 1987 and 1988 to do this.
IT

Response: Disagree. Because of the variability of the water table surface in response to river stage, and the small decline in size of the groundwater mound following reduction in discharge in February 1987 from 3 million gallons a day to 1.2 million gallons, it is unlikely that picking four consecutive quarterly flow nets for two years will necessarily be equivalent or comparable for providing meaningful interpretation of the influence of flow patterns. However, as part of the investigation, an attempt will be made to compare flow maps that are from equivalent quarters to see if any discernable changes occurred in the flow patterns (e.g., reduction in the size or gradient near the groundwater mound) near the process trenches.

66. WP-44, Sec 2.2.4.1, P. 1, 2nd sent: As much of the 300-FF-5 operable unit is vegetated, transpiration is also an important precipitation loss source. Include transpiration in sentence.
IT

Response: Agree. Sentence modified accordingly.

67. WP-45, Figure 15: The location of the FF-5 OU is significantly downstream from the shown location. We suggest that the actual location be used as opposed to simply changing the notation from the HR-3 Work Plan.
IT

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Response: Agree. Figure will be modified.

68. WP-45, Sec. 2.2.4.2, P. 2: In the vicinity of FF-5 both banks of the Columbia River are relatively steep. Because of this it is difficult to see how the wetted width of the river can change over 1100 ft. Please check the numbers.
IT

Response: The presence of islands accounts for the wide variation in wetted width, not changes in water level. The overall width of the river does not change significantly through the region, however the islands reduce the wetted width. This will be clarified in the text.

69. WP-46, Section 2.2.4.2, second full P.: It is not clear whether the flood of 1,400,000 cfs assumes mitigative effects of dam systems on the river or is based on a pre-dam scenario. Please clarify the river conditions that result in this flood.
OCC

Response: Agree. The text will be modified to indicate that the PMF is estimated under current regulated conditions.

70. WP-48, Sec 2.2.6: Are all of the federal and state endangered or threatened species listed in this section? If not, please include them in the appropriate subsection.
HAZWRAP

Response: Information on the white pelican (Federal sensitive) and the giant Columbia River limpet and great Columbia River spire snail (Federal candidates) were included.

71. WP-57, Sec 2.2.7.3.1: Operable Unit 300-FF-5 has been identified as an archaeological sensitive site. The third paragraph indicates that a detailed archaeological investigation is required before any surface activities begin. More information concerning this investigation should be included.
HAZWRAP

Response: Accept. Surface work at surface exposures, and backhoe and augering for subsurface work will be performed. This will be added to the text.

72. WP-58, Section 2.2.7.3.2, P. 2: State the source of information for the fact that the riverbank, etc. are sacred to the Indians. If it is Relander

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(1956), this is unclear. Also state the potential impact this has on the investigation, if any.
IT

Response: Interviews with Umatilla, Yakima, and Wanapum Indians have yielded this information. Because the riverbank is sacred, the American Indian Religious Freedom Act, as described in Chatters (1989), must be followed.

73. WP-59, Sec 3.1.2, P.1, S. 3: Sentence should read "All of these. . ."
HAZWRAP

Response: Accept. Text will be modified.

74. WP-60, Sec. 3.1.2, P. 2: Boring 399-S-7 was not a valid background sample when used as such in the FF-1 Work Plan, and it is not valid here either. By repeating the use of erroneous numbers, the numbers tend to take on a life and "truth" of their own. It is evident that both PNL and Golder need to take a realistic view of what these data say and mean. Numerous other reviewers have commented earlier on this boring. Please delete reference to 399-S-7 as "background" data and find information that is truly indicative of background. If such data are not available then obtaining truly background values is a valid effort for the 300-FF-5 work effort and it should be added.
IT

Response: At present, there are no other vadose sediment concentration data than those from the cited S-7 pit samples (see Table 6) that can be used for background total chemical compositions. Pit S-7 was dug for 300 Area process pond characterization studies documented in Dennison et al. (1988). The pit is just north of the northeast corner of 316-1. Examination of data presented in Table 6 does not suggest that Pit S-7 is significantly contaminated with any regulated chemicals or radionuclides. Therefore, these data will be considered a preliminary background. As part of the 300-FF-1 and 300-FF-5 soils investigations, additional samples will be collected and analyzed. Should these samples yield lower chemical contents than those from Pit S-7, a new background will be established.

75. WP-60, Sec. 3.1.2, Para. 4: A discussion is necessary to show the background soil samples chosen are truly background. The parameters analyzed for but not detected would also be useful.
IT

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Response: Accept intent. There is no misconception that the data presented are "truly background." The discussion will be modified to reflect that the existing data are all that we have and that additional data will be collected in the RIs for 300-FF-1, 300-FF-2, 300-FF-3, and 300-FF-5. The parameters analyzed for, but not detected, are indicated by a < (less than) symbol.

76. WP-61: The choice of key contaminants to study should be addressed in far greater detail, including mobility, and how other contaminants (perhaps more toxic and less mobile) will be correlated to results.
NUS

Response: The following will be added: "Uranium and nitric acid were major constituents in the processes discussed in Section 2.1.3 and, in fact, can be delineated as groundwater plumes. TCE and DCE are known to be quite mobile, water-insoluble organics and present in some monitoring wells in the 300-FF-5 operable unit. Of lesser importance are copper, chloride, and chloroform. These three constituents are found in the groundwater and the latter two are mobile and should help delineate the extent of contaminated sediments."

Until more knowledge is available, speculation or correlation of the distribution of other contaminants that are more toxic but less mobile from results on indicator species will not be included in this Work Plan. Recall (Section 5.3.3) that a select group of sediments will be analyzed in detail for all likely contaminants. Sediments in close proximity to known disposal facilities and those that have higher concentrations of readily measured indicator species will be analyzed in greater depth for more toxic but less mobile chemicals.

77. WP-61, Section 3.1.2, P. 4: The conclusion presented in this statement regarding key contaminants is not at all obvious from Table 6. Since groundwater quality data are not presented until later in Section 3, this statement, if valid, should be moved to later in Section 3.
IT

Response: Accept intent. The additional material added for comment 76 will allow the reader to understand our choice of indicator species. Similar statements about what constituents will be key groundwater indicator species are discussed in the following section. We consider it appropriate to list key indicator species for sediments in the earlier section per RI/FS outline ordering.

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78. WP-61, Sec. 3.1.2, Para. 8: A discussion of the background for choosing these compounds is warranted, especially with high methylene chloride detections in the groundwater.
IT

Response: Agree. See the response to comment 76. The methylene chloride analyses of groundwater samples have been suspect and reported as such (schalla et al. 1988). Therefore, methylene chloride is not considered a good indicator because it appears to be contamination introduced during the sampling/analysis process.

79. WP-62: Should discuss the portion(s) of the aquifer(s) from which the "Hanford-wide" background concentrations are taken.
NUS

Response: Agree. The portions of the "Hanford-wide" samples were obtained primarily from the upper 20 ft of the unconfined aquifer. The geology of this portion of the unconfined aquifer includes both the Hanford and Ringold Formations.

80. WP-62, Sec. 3.1.3.1, Para. 1: A definition of the upper geohydrologic systems is needed. As stated it could mean topographically higher or hydrostratigraphically higher.
IT

Response: Agree. Actually, the words will be changed to "the unconfined aquifer in the Hanford and Ringold Formation" rather than "the upper geohydrologic systems".

81. WP-62, Sec. 3.1.3.1, Para. 2: The 399-1-18 cluster may represent unit background, but not Hanford background due to possible upgradient sources. Clarify which "background" will be used for comparison.
IT

Response: Agree. Well Cluster 399-1-18 is used as background for the 300-FF-5 operable unit as stated in the first sentence of the paragraph.

82. WP-62, Sec. 3.1.3.1, GENERAL: The reader postulates a third background for at least part of the year. Groundwater table maps indicate flow from the river to the shallow water table during April 1987, Fig. 13.
IT

Response: Agree in part. There will be times of the year that river water enters the groundwater system and may reach wells within a couple of hundred feet of the riverbank during extended periods of high water

level during the spring. Investigators should be aware of this phenomenon, but we do not think this warrants calling river water background.

83. WP-62, Sec. 3.1.3.1, P. 2: FF-1 comment 148 refers to a need for some justification on the use of the 3-1-18 well cluster as a background well when it lies within a mapped chloride plume. Circular referencing back to the FF-1 Work Plan is not appropriate. Please provide the justification for the use of this well as a "background" data point.
IT

Response: Disagree. Comment 148 refers to a chloride plume that does not exist, nor is one known to have ever encompassed groundwater flowing through well cluster 399-1-18. The chloride plume alluded to on page 3-50 of the 300-FF-1 work plan is not a plume, but a map created by compositing the maximum chloride concentration over a 2 year period (1985-1987). A small rise, that is about 80 percent above background occurred a few years ago at well cluster 399-1-18, but we do not think this constitutes a plume. In any case, well cluster 399-1-18 serves as a background well for the 300-FF-5 operable unit, not as a background well for the Hanford site. Therefore, if Hanford site operations upgradient of the well 399-1-18 cluster produce a chloride level higher than 300-FF-5, that higher chloride level becomes the background value. Data collected during the past 2.5 years indicates that this cluster provides samples representative of conditions upgradient and north of the 300 area regardless of changes in river stage during this period. This well cluster will detect contaminants migrating into the 300-FF5 operable unit from sources located north and northwest of 300-FF5.

84. WP-63, Table 7: Several compounds are missing from this table which are shown on Table 8 (U, Total C, TOX, Fe, and coliform). Even though these are non-detects, they should be listed for consistency.
IT

Response: Agree. These constituents will be added for consistency with Table 8.

85. WP-65, Table 8: If "Standard" refers to standard deviation, then the table should so state.

This table should match Tables 3-14, 3-15 and 3-16 in the FF-1 Work Plan as they reference the same source. The data do not match in all cases. The reason for this discrepancy should be explained.

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Comparison of Table 8 with Table 10 yields some definite discrepancies. Table 10 lists several elements as being significantly above background, yet these elements and compounds are not listed on Table 8. Missing from Table 8 are: Al, Pb, Cu, CN, Hg, PO_4, Se, Ag and S. Missing organic compounds include: chloroform, bis 2 ethyl hexyl phthalate, methylene chloride, MEK and TCE. Missing radionuclides are: cobalt-60, hydrogen-3, strontium-90 and technetium-99.
IT

Response: Agree and disagree. We agree that standard means "mean standard deviation" and the table will be modified accordingly. We agree that the data do not match, but the values shown in the 300-FF-5 Work Plan are correct. The reason for the difference is not certain, but is likely due to several reasons: 1) the cutoff for data in the Schalla 1988 report was June 1987, while the cutoff for this report was June 1989; and 2) a difference in the way "less than" data were used in calculating the mean values. The detection limit was used for 300-FF-5 while it is likely that values less than the detection limit (either zero or half the detection limit) were used in 300-FF-1. Therefore, no changes will be made in the values shown in Table 8 (i.e., disagree). These compounds are not listed in Table 8 because there are not any background values available (i.e., all were below detection limit in the background wells in cluster 399-1-18, or the values have been shown to be unrelated to groundwater conditions (e.g., methylene chloride, MEK, etc., Schalla et al. 1988, Evans et al. 1988b). Therefore, we disagree and these constituents noted in comment 85 will not be added to Table 8.

Also, Table 8 and Table 10 report different values. Table 8 reports means while Table 10 reports maximum values. The tables should be different.

86. WP-65, Table 8: Should indicate the number of samples used as basis for the means, and the time period over which the samples were collected. (Should be explicit if "standards" are standard deviations.)
NUS

Response: Agree. The number of samples for wells 399-1-18A, -1-18B, and -1-18C will be added to Table 8. The time periods are February 23, 1987 to August 6, 1989 for well 399-1-18A; March 31, 1987 to June 8, 1989 for well 399-1-18B; and March 31, 1987 to August 16, 1988 for well 399-1-18C. This information will be added as a footnote to the bottom of Table 8. We agree that standard will be changed to standard deviation.

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87. WP-65, Table 8: On all tables, the nitrate values must be specified as Nitrate-N or Nitrate-NO_3. This is important when comparing to standards and between units.
IT

Response: Agree. The nitrate values are for NO_3. This will be noted in the table.

88. WP-65, Table 8: Should use either p/b (or ppb) or ug/l uniformly throughout the document (e.g., Table 8 (page WP-65) versus Table 10 (page WP-74)). The standard units to report data in (page SAP/QAPP-14) should be the same units.
NUS

Response: Agree. The notation $\mu g/L$ will be used.

89. WP-67, Sec 3.1.3.1, last Sent.: This sentence needs to be rewritten. Stratigraphic position is not hydraulically connected with anything. It is, however, generally confined to some definite time series in the geologic column. In fact, the water levels being equal can have several meanings: 1) that the heads are separate but equal; 2) that the well seal is insufficient and leakage is occurring in the upward direction or 3) leakage is occurring in the downward direction. The definition of artesian does not require the head in a lower aquifer to be above that of an overlying aquifer.
IT

Response: Agree. There is no evidence of a natural or artificial (e.g., a pathway created during drilling) vertical, hydraulic interconnection between the unconfined and confined aquifers at or in the vicinity of well 1-18C. In fact, there is no evidence of any appreciable hydraulic interconnection between the unconfined and confined aquifers anywhere in the FF-5 operable unit except at well 1-16D. The water chemistry in well 1-18C is equivalent to that found in the confined aquifer, but it is in hydraulic equilibrium with the unconfined aquifer for the reasons presented herein. The following explanation will be inserted on page 67. "Well 1-18C is completed in what would be best described as a unique portion of the unconfined aquifer compared to confined aquifer wells such as 1-17C shown in **Figure (new schematic)**. Like most wells screened in the confined aquifer, well 1-18C is screened below layer M3; however, it is underlain by the Goose Island basalt flow, not the Martindale basalt flow. Apparently, groundwater from the confined aquifer slowly flows from the Martindale basalt upward through the Goose Island basalt and into the gravelly sand above the Goose Island. Because the hydraulic gradient is upward from the Martindale basalt flow, the water chemistry in well 1-18C is the

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same as well 1-17C. The hydraulic head is lower in 1-18C for two primary reasons: (1) most of the hydraulic head is lost overcoming the resistance to upward flow as the groundwater flows through the dense columnar basalt of the Goose Island layer; (2) layer M3 is not as thick as in most of FF-5 and therefore the remaining confined hydraulic head is lost when the hydraulic head in the gravelly sands at well 1-18C equilibrates with the hydraulic head in the unconfined aquifer."

90. WP-67, Section 3.1.3.1, P 2: Since there appears to be intercommunication between the confined and unconfined aquifers at well 399-1-18C, it is strongly recommended to discontinue use of this well cluster to establish background conditions.
IT

Response: Agree. But prior to execution of the work proposed in this plan, there are no better data. While the water potentials are not indicative of the confined system, the chemistry is similar to other confined positions. These data will continue to be used for comparison purposes until additional wells are completed in the confined system.

91. WP-67, Sec. 3.1.3.1, Para. 5: Well 399-1-18 may also have an ineffective annular seal. Purging the well prior to sampling would bring water preferentially from the screened zone--indicating the screened intervals' water quality, however the water level could stabilize at a water level different than the screened intervals. Also, in the case of 399-1-18, an upward gradient form the confined unit would prevent shallower water from moving down the breached annular seal.
IT

Response: Disagree. There is no reason to believe well 399-1-18C has an ineffective annular seal. See response to comment 89.

92. WP-71, Figure 20: Unclear to have wells labeled twice in same legend as both "well location and number" and "unconfined aquifer well" (e.g., Figure 20, page WP-71). Labeling in Figure 21 (page WP-72) is especially poor.
NUS

Response: Disagree. No other reviewers had problems with the notation.

93. WP-74, Table 10: It would be most useful, and considerate, if Tables 8, 10, 11 and 12 used the same order of listing for constituents. Please revise the order of listing for ready comparison between tables.

Response: In general, the listings are alphabetical.

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On certain items, the detection level is such that if one looks for the item it is found. For instance, all groundwater has a pH and specific conductance. Please either explain why these were detected on only a portion of the analyses or correct the table.

Response: Field pH and specific conductance were obtained on all samples as noted in Table 8 and 10. If additional samples appear on the tables, they represent duplicates (splits) of one sample sharing a common field pH and specific conductance value.

With regard to footnote "a" we agree with EPA comment 106 on the FF-1 Work Plan. Sampling was insufficient to permit a valid statistical distribution to be determined. It appears that the statistical distribution from FF-1 was duplicated here, indicating no improvement in the analysis of the data.

Response: The number of values may be insufficient for some constituents, but the statistical methods have been correctly applied to the data available.

The maximum determined value for filtered sodium appears to be in error by an order of magnitude.
IT

Response: It does appear that one sodium value (i.e., the maximum) is one order of magnitude too high. The data have been reviewed, but a valid basis for deleting this datum or altering its value could not be determined. Therefore, the value has been included.

94. WP-76, Table 11: The detects vs analyses for pH and specific conductance should be a 1:1 ratio.

See EPA comment 106 on FF-1 WP.
IT

Response: Agree. Both values should be 39 for pH and Specific Conductance in Table 11. This will be corrected.

95. WP-76, Table 12: See EPA comment 106 on FF-1 WP.
IT

Response: Agree. The number of values may be insufficient for some constituents, but the statistical methods have been correctly applied to the data available.

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96. WP-74 through WP-78, Tables 8 through 10: Two pH values are listed. If this means that pH ranged from 6.4 to 8.5 then show as 6.4-8.5. If there is some other explanation, please state.
IT

Response: Agree. pH ranged from 6.4 to 8.5, therefore a dash will be added.

97. WP-74 to WP-77, Tables 10 & 11: Could provide background values in Tables 10 and 11 for comparison.
NUS

Response: The authors felt that Table 8 will suffice for this purpose.

98. WP-79: Should explain why contaminants found in groundwater were not used. Why is copper a better choice?
NUS

Response: Disagree. Copper was used because of the metals (excluding uranium) detected, it was detected in a sufficient number of wells to describe the extent and configuration of the contamination plume. Metals such as lead are not sufficiently mobile, even following a spill to delineate the areal extent of its plume.

99. WP-79, Sec. 3.1.3.2.1, Para. 1: Again, specify Uranium concentration which is considered "background". The outer contour on the maps should then match this level (or come close).
IT

Response: Agree and disagree. We agree the background concentration of uranium should be added, and it is about 2 to 4 ppb. The outer contour on the figures does come close, it is 5 ppb.

100. WP-84: "Ubiquitous" appears to have been used inappropriately.
NUS

Response: Disagree. The sentence is essentially a direct quote from an EPA document by Callahan et al. (1979). The only change was the substitution of the first word trichloromethane with the synonym chloroform, and this substitution was done for consistency in terminology. Otherwise, the phrase would have been in quotation marks.

101. WP-84, Sec. 3.1.3.2.3, Para. 1: A plume map or set of plume maps showing the known extent and distribution of contamination due to organic

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compounds would be useful to the reader. A list of compounds which have been analyzed for is also needed.
IT

Response: Agree in part, but can not comply. Plumes are no longer present in the upper portion of the unconfined aquifer. The concentration of volatile organics in the bottom of the unconfined aquifer can not be described because only 4 wells penetrate this zone. Of these four wells one is a non-detect, background well. Of the three remaining wells, only two have detected contamination. Therefore the extent of the existing plumes cannot be described. A list of compounds which has been analyzed includes the WAC-9905 list, which would cover several pages of fine print.

102. WP-88: The text says "distinguishing isomers [of dichloroethane] may provide information about location of contamination source areas based on their unique ratios and concentrations". Is this to be done? If so, it should to be addressed in Sampling and Analysis Plan (Attachment 1).
NUS

Response: Agree. This method for distinguishing these will be addressed in the sampling and analysis plan.

103. WP-88, Sec. 3.1.3.2.3, Para. 4: Need to address how residual contamination could be released (i.e., soil flushing, vapor transport, dissolution of NAPL).
IT

Response: Agree. Therefore we will add the following to paragraph 4. "The residual contamination present in the bottom of the unconfined aquifer is probably due to dissolution of DNAPLs composed of TCE and 1,2-DCE, which have collected on the bottom of the aquifer."

104. WP-88, Sec. 3.1.3.2.3, Para. 5: This paragraph says that dense non-aqueous phase liquid (DNAPL) have been found in 300-FF-5. Low concentrations of 1,2-DCE and TCE in water won't necessarily sink because the solution density is similar to aquifer water. The detection of 1,2-DCE and TCE in the deep unconfined aquifer may suggest the presence of DNAPL.
IT

Response: Agree. See response to question 103 for clarification needed prior to paragraph 5.

105. WP-88, Sec. 3.1.3.2.3, Para. 5: Discussion of the abandonment method is or may be needed. If possible, overdrilling the old casing followed by

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pressure grouting may be warranted. It would be difficult to explain contamination moving downward in the original annulus since hydraulic gradients would cause upward flow.
IT

Response: Disagree with all three parts of the comment. (1) The proposed abandonment will be discussed in Section 5. The following sentences will be added to the last paragraph in section 5.3.4.4. on page 159 of the Work Plan: "The borehole should be drilled adjacent to wells 1-16C and D to a depth of 180 feet. A cement seal should be set opposite the M3 layer with a steel casing liner prior to penetrating the last 20 feet of the borehole. After the cement seal has set, the well should be deepened to 180 feet. A tremie pipe with an inflatable packer should be lowered to near the bottom of the casing opposite the M3 layer and the packer inflated. Grout should be pumped under pressure through the tremie pipe to seal off about one acre of the upper confined aquifer. This method does not require sealing the vertical pathway through the M3 layer along the broken casing near well 1-16D because the grouting reduces the upper confined aquifer hydraulic conductivity to that of layer M3." (2) Overdrilling the old casing followed by pressure grouting was already attempted at well 1-16D with state-of-the-art oil field equipment, but the attempts were unsuccessful. (3) Hydraulic gradients are reversed during high river stage and during purging well 1-16C prior to sampling. The full purging cycle drawdowns Well 1-16C approximately 20 feet which is a substantial reversal in hydraulic gradient. With the gradients reversed contamination from the unconfined aquifer would migrate downward into the confined aquifer.

106. WP-88, Sec. 3.1.3.2.3, Para. 6: Address which well or wells on which the study was conducted. Also, discuss whether any trends were seen supporting to continuing use of this method to find source areas.
IT

Response: There are only 5 paragraphs on page 88; therefore, it is assumed that the comment refers to paragraph 5. The study was conducted on wells 399-1-16A, -16B, 1-16C, and 1-16D (Fruland, et al. 1989, Smith et al. 1989). These results indicate that the ratios of PCE, TCE, trans- and cis-1,2,DCE were different for the top of the unconfined aquifer versus the bottom of the unconfined aquifer. The source of the PCE and TCE in the top of the unconfined aquifer appears to be very new because neither the cis nor trans isomers of DCE are present above detection limits set at 20 to 40 ppt (parts per trillion). The TCE in the bottom of the unconfined aquifer is much older based on the much greater dominance of the cis isomer over the trans isomer and the parent isomer TCE. This is one example how two plumes can be differentiated.

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The source of the TCE in the top of the unconfined aquifer is the process trenches. If additional wells were available like those noted in the work plan for the 300-FF-5 operable unit, it might be possible to identify the source of TCE contamination in the bottom of the confined aquifer. Other sources of contamination could be identified by their unique distribution of isomers. Results from other studies in the open literature (Schalla et al. 1986, Schalla et al. 1984, Vogel and McCarthy 1985, Wilson et al. 1983b) indicate similar results for degradation and identification of source areas.

107. WP-93: The analytical results of previous sampling of seeps should be presented and discussed relative to concentrations in nearby wells.
NUS

Response: Accept intent. This is a good idea and is exactly what is presented in this plan. These results are discussed in Section 3.1.4.2, p. 96 and 97. Text will be expanded slightly to include general comparison of seep and groundwater contaminant concentrations.

108. WP-96, Sec. 3.1.4.2, Para. 4: Address whether organic compounds were analyzed; if so, were they detected? Organic contaminants are of as great a concern as radionuclides. Also describe the different river stage periods covered by the sampling and determine if there are any trends related to flow.
IT

Response: Sample results (organic analysis) are not yet referenceable, data should become available during the RI process. River stage during the referenced spring was not recorded at the 300 Area and there is no direct correlation between the flows at Priest Rapids Dam and river stage at the 300 Area. There is too little information to perform meaningful trend analysis at this time.

109. WP-96, Sec 3.1.4.2: Need to define which Student T-Test will be used during the statistical analysis.
HAZWRAP

Response: This section discusses past efforts and does not state what will be done with respect to future sample result analysis. Descriptions of what will be done should be discussed elsewhere. Text states "paired sample comparison, Student's t-test of differences" and provides a reference for further definition if needed.

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110. WP-99, Sec. 3.1.4.4, Para. 1: Discuss or locate other sites on the Columbia River adjacent to 300-FF-5 which had radionuclide contamination in the sediments.
IT

Response: The authors are unaware of other sediment data along the operable unit. In reviewing the text, there is a need for some clarification which will be made.

111. WP-103, Section 3.2.1.2: Discussion of water standards should also address if MCLGs are to be candidate ARARs.
IT

Response: The best EPA guidance on the use of MCLs and/or MCLGs for chemical-specific ARARs (not including draft guidance) appears in 52 FR 32496, August 27, 1987. This guidance states that "in most situations encountered in CERCLA actions the Agency's drinking water standards, known as Maximum Concentration Levels (MCLs), are appropriate as cleanup levels..." There is controversy about this guidance and it may change. However, because the present document is a work plan, because there exist at least two later opportunities in the CERCLA cleanup process for identification and examination of chemical-specific ARARs (in the RI and FS phases), because new EPA guidance may be available by then, and based on existing EPA guidance, we cite 40 CFR 141 and its MCLs in Section 3.2. We have added the word "enforceable" to describe MCLs as enforceable standards in Section 3.2.1.2.

112. WP-104, Sec. 3.2.1.2, Table 21: Other organic compounds such as 1,1,1-TCA, PCE and methylene chloride have been detected in the groundwater at 300-FF-5 and should be included as potential ARAR's.
IT

Response: Agree partially. Potential ARARs added for 1,1,1-TCA, PCE, and carbon tetrachloride. There is no existing or proposed MCL for methylene chloride.

113. WP-108: It appears that parameters were screened based on concentration and frequency of occurrence, without consideration of toxicity, persistence or mobility; these should be primary considerations.
NUS

Response: Reject. Table 22 contains the chemical constituents of primary importance identified in Section 3.1.1. The list in Table 22 is based on previous evaluation of waste volumes and characteristics and the known nature and extent of contamination. In addition,

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constituents with concentrations known to be both highly elevated above background levels are also included as contaminants of concern. The preliminary toxicity assessment provides the basis for preliminary screening of the potential contaminants of concern.

114. WP-108 and SAP/FSP-11: On WP-59, five constituents (unique to the 300-FF-2, FF-3, and -IU-1 operable units) are listed (methanol, PCBs, MIBK, solvent-refined coal, and Pm 147). These should be included in the initial round of sampling.
NUS

Response: Agree. All but solvent refined coal will be added to the initial round of sampling.

115. WP-108: The text states that Table 22 contains all the waste constituents of primary importance, "as identified in Section 3.1.1." The text at Section 3.1.1 (page WP-59) states that five other components were of concern; the table should include these constituents. In addition, as the text on page WP-108 states that values known to be both highly elevated above background and commonly found are "also" included, it appears that Section 3.1.3, Table 10 (page WP-74) should also be referenced. (Note that bis(2-ethyl hexyl phthalate is apparently missing.)
NUS

Response: Partially accept. This comment is partially addressed in the response to comment 120. The five other components were listed in Section 3.1.1 as present in the operable unit, but were not necessarily constituents of concern. All but solvent refined coal will be addressed during the RI/FS. Solvent refined coal is not a specific constituent for which an analysis can be performed. Table 10 (page WP-74) in Section 3.1.3 is referenced in the last sentence of the first paragraph in Section 3.3.2. The constituent bis(2-ethyl hexyl) phthalate was detected twice in 33 analyses, so it does not meet the criteria for being commonly found (present in at least 10 percent of the samples) and was therefore not included in Table 10.

116. WP-108: The toxicity of radionuclides should be addressed.
NUS

Response: Reject. The toxicity of radionuclides is included in definition of the ARARs.

117. WP-108, Sec. 3.3.1.2, Para. 2: Address distance from the Richland water supply to 300-FF-5.
IT

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Response: Accept. Add as the second sentence of the last paragraph in Section 3.3.1.2 the sentence "The Richland water supply is located approximately 4 miles downstream from the 300-FF-5 operable unit."

118. WP-108 and WP-110: The second paragraph on page 110 does not appear to be consistent with page 108. WP-108 appears to indicate that the preliminary toxicity assessment was done based on groundwater diluted by a factor of 1.2 E+5. But WP-110 talks about an assessment based on the concentrations found in groundwater. Does this mean that the dilution factor was not applied? If so, why not? If it was applied, please clarify the statement.
OCC

Response: Accept. The last paragraph on page WP-108 was a description of the approach used for the 100-HR-3 operable unit. This paragraph, continuing on page WP-109, has been deleted. The preliminary toxicity assessment for the 300-FF-5 operable unit was based on comparison of critical toxicity values with the maximum concentrations observed in the environment. The dilution factor was not applied.

119. WP-109: The assumed lifetime of exposure should be stated.
NUS

Response: Reject. The comment appears to refer to the first paragraph at the top of page WP-109. This discussion of the 100-HR-3 operable unit has been deleted.

120. WP-109, Section 3.3.2, Table 22: The additional constituents that are known to be present at 300-FF-2, 300-FF-3, and 300-IU-1 (see section 3.1.1, page WP-59) should also appear in the listing of potential contaminants of concern.
IT

Response: Accept. The text on page WP-108 (Section 3.3.2), where Table 22 is referenced, should be modified as follows. Add to the end of the first paragraph in Section 3.3.2: "In addition, the parameters identified in Section 3.1.1 as present, but poorly characterized in terms of the amounts disposed, are included as contaminants requiring additional characterization. These contaminants include:

- Methanol
- Polychlorinated biphenyls
- Methyl isobutyl ketone
- ^{147}Pm."

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121. WP-111, Table 23: Based on the concentration of ammonium present and using the ratio of ammonia to ammonium at ambient conditions, it should be possible to estimate the concentration of ammonia in the groundwater. The maximum value should be presented in Table 23.
NUS

Response: Reject. The values in Table 23 are measured from samples collected in the field. Ammonium is included in Table 24 as a contaminant of concern and Ammonia-N will be sampled for the 300-FF-5 groundwater (see Table 33, p. WP-155).

122. WP-111, Table 23: The proposed assessment values, as discussed in text for methanol, PCBs, MIBK, solvent-refined coal, and PM147 (page WP-59), should be included in Table 23.
NUS

Response: Reject. There are no data on these constituents in the groundwater at the 300-FF-5 operable unit. Therefore, values for these constituents have not been included in Table 23.

123. WP-112: Mobility/attenuation of the individual contaminants of concern should be addressed under contaminant characteristics.
NUS

Response: Accept. Add: "The mobility and attenuation of the individual contaminants of concern will be investigated in Task 3 of the Remedial Investigation" to the end of the second paragraph of Section 3.3.3.

124. WP-112, Sec. 3.3.3, Para. 1: Biological degradation of organic compounds may also be important as is detailed previously with PCE degrading to TCE and 1,2,-DCE. Volatilization may be fairly minor in the groundwater.
IT

Response: Accept. Replace sentence in first paragraph of Section 3.3.3 "The important mechanisms by which organic (e.g., chloroform, trichloroethene, etc.) concentrations in aquatic environments are reduced are by volatilization" with "Concentrations of organic constituents (e.g., chloroform, trichloroethene, etc.) in aquatic environments are reduced by biological degradation and volatilization.

125. WP-112, Sec. 3.3, Para. 2: The different contaminant plumes may be compared to attempt to determine relative retardation if the source periods are known. Authors need to reference studies where attenuation of Cs or inorganics was determined.

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IT

Response: Partially accept. The mobility and attenuation of individual contaminants of concern will be investigated in Task 3 of the Remedial Investigation. Change the third sentence of the second paragraph in Section 3.3.3 to read "Constituents such as ^{137}Cs are highly attenuated in Hanford sediments (Routson et al. 1981) and will move..."

Reference: Routson, R. C., G. S. Barney, R. M. Smith, C. H. Delegard and L. Jensen. 1981. Fission Product Sorption Parameters for Hanford 200 Area Sediment Types. RHO-ST-35, Rockwell Hanford Operations, Richland, Washington.

126. WP-112, Sec. 3.3.4, P. 3: A gamma scan is an analysis not a contaminant of concern.
IT

Response: Accept. Gamma scan has been deleted from Table 24. The first sentence of the last paragraph on page WP-112 should be modified to "Even though no gamma-emitting radionuclides met the criteria for being designated as contaminants of concern, gamma scans will be performed because of the general nature of wastes disposed within the source operable units overlying the 300-FF-5 ground-water operable unit.

127. WP-113: As coliform has been detected in concentrations which exceed ARARs, should explain in greater detail why coliform is to be omitted "due to its nonspecificity as an indicator of environmental concern".
NUS

Response: Accept. Delete first paragraph on p. WP-113 and add total coliform to Table 24 (see original position in Table 22).

128. WP-113, Section 3.4, P 1: The second sentence indicates that it is desirable to have health risks ("ensuring that ... adequate health risks, ... are achieved). A more appropriate statement of the remedial action objectives would be "health risks are kept below acceptable limits".
IT

Response: Agree. The first general objective in the first sentence has been revised to read: "... (1) protecting human health by ensuring that ARARs will not be exceeded and that health risks, as determined through analysis of all exposure routes, will be kept at or below acceptable limits and (2)..."

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129. WP-113, Sec 3.3.5: When addressing impacts (also Sec 5.3.9), cumulative impact of contaminants is also of concern.
NUS

Response: Agree with intent of comment, partially accept. Cumulative impacts for chemicals and radionuclides will be addressed during the exposure assessment portion of the baseline risk assessment described in Section 5.3.9. However, the preliminary toxicity assessment is based on comparison of observed concentrations with the appropriate ARARs or critical toxicity values. Therefore, cumulative impacts were not considered.

130. WP-113, Sec. 3.3.4, Table 24: The contaminants of concern should remain as listed on Table 22 until source and groundwater investigations support the deletion.
IT

Response: Reject. Contaminants in Table 22 which are not included in Table 24 were omitted because the maximum values of these constituents detected in the environment were less than the ARARs or critical toxicity values in Table 23. The contaminants in Table 24 are identified as constituents to which particular attention must be paid during the RI/FS. However, other constituents, such as arsenic which appeared in Table 22 but not in Table 24 because it was less than its ARAR, will be sampled and analyzed for extensively during the RI/FS. If higher concentrations of arsenic or any other constituent are discovered, that constituent will be added to the list of contaminants of concern.

131. WP-113, Table 24: Since gross analyses are not contaminants, this table should contain a list of those radionuclides which will be taken into account by the analytical techniques.
IT

Response: Agree with intent, but disagree with resolution. Gross alpha and gross beta are screening methods which, if reported as high values, will be separated into specific radionuclides. Specific radionuclides to be sampled for are identified in Table 33 (Section 5.3.4.2) and Table 24.

132. WP-117, Section 3.4.2, Table 26: Gravity separation, granular bed filtration, and evaporation are not true treatment response actions for sediment as these are only optional precursors to the discharge response action. These so-called "treatment" response actions only facilitate waste handling and do not alter the hazardous characteristics of the waste.

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IT

Response: EPA lists gravity separation, granular bed filtration, and evaporation as process options under treatment technologies for soils, sediments, and sludge. (OSWER directive 9355.3-01, Table 4.1). While the classification of any technology is subject to opinion, PNL chooses to follow EPA guidance. No revisions have been made in response to this comment.

133. WP-117, Section 3.4.2, Table 26: Thermal destruction processes, e.g., pyrolysis, should be included for comparison of sediment/solid waste treatment options.
IT

Response: Agree that incineration/pyrolysis processes are potentially applicable to the treatment of the organic contaminants of concern listed in Table 23 of the Work Plan. Table 26 has been revised to include incineration/pyrolysis as a process option for sediments/secondary waste solids thermal treatment technology.

134. WP-118, Section 3.4.2, Table 27: The use of "novel in situ concepts" for biological treatment is not recommended because of the lack of long term effectiveness, implementability, and cost data required for further screening during the FS process. Instead, it is recommended to focus on BATs for which sufficient data are available.
IT

Response: Agree that novel in situ biological treatment technologies have not undergone the same level of development as other biological treatment technologies. However, novel technologies should be formally reviewed to ensure that any new developments in in situ techniques are identified and evaluated regarding their potential to be ready for evaluation via a treatability investigation in order to obtain the necessary data for detailed analysis. No revisions to Table 27 are made in response to this comment.

135. WP-120: Data quality objectives should include consideration of parameters needed to evaluate feasibility of remedial measures under consideration.
NUS

Response: Agree. This concept is presented in the first sentence of Section 4.1. At the time of preparing this report, we don't know what remedial measures will be considered, only that we must perform a risk assessment. Therefore, the focus is on characterization. At a later

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time, the focus will move to data required to evaluate remedial measures.

136. WP-120: Summarizing the types of samples and locations would clarify data quality objectives. A "master drawing" illustrating all the sampling points would be useful to tie the sampling tasks together.
NUS

Response: Agree. This has been done in the form of Table 28 and figures that identify sampling locations.

137. WP-120, Section 4.1: This paragraph should address the saturated soils within the aquifers. The words should be consistent with page WP-59, section 3.1.2, second paragraph, i.e., saturated soils within 300-FF-5 operable unit are not likely to exhibit high concentrations of hazardous materials.
IT

Response: Agree. This was the intent of the statement in the middle of the paragraph where "contaminant concentrations in the aquifer" is stated. A parenthetical statement will be added to indicate that this includes both groundwater and the sediments. This is consistent with the first two types of "data needed" in Table 28.

138. WP-121, Section 4.1.2, P 2: Section 4.1.2 states that aquatic biota data are not a key need because the data discussed in Chapter 3.0 suggest that this medium is not presently significantly contaminated.

The data presented in Chapter 3.0 are only for radionuclides. Section 3.1.6.2 states "Site-specific data concerning the contamination levels of aquatic fauna in the vicinity of the 300 Area are virtually nonexistent." Page WP-127 states that no data are available on the contaminant concentrations in river biota. Therefore there is no basis for excluding the biotic medium when determining the nature and extent of contamination. See Table 28, page WP-122.
IT

Response: Agree in part, disagree in part. Agree that there are few data for aquatic biota and that is precisely why the biotic task is included in this Work Plan. Disagree that the biotic medium is of key importance at this time. Biota will be sampled and analyzed as part of risk assessment work. This may just be a difference in priorities or grouping of data needs.

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139. WP-122, Table 28: This table lists Levels III and IV as analytical levels for most of the chemical analyses. This table is inconsistent with Table 3 of the QAPP which invokes only Level III for all analyses except radiation and organic vapor screening. It is acceptable to use Level III for screening even though the cost difference between Level III and Level IV is not very great for most labs. However, Level IV is the only acceptable analytical level for compliance verification on a CERCLA site, particularly for those areas which are found to be clean. Level IV requires the use of CLP protocols and data validation, whereas with Level III these are merely options. Level IV does not require that the lab itself be a member of the CLP. It has become a popular misconception at Hanford that Level IV analyses can only be performed by labs which are members of the CLP. EPA has clearly stated in a number of meetings that this is not the case.

Response: Agree. The analytical levels will be made consistent between the two sections. Level III will be used except where Level IV must be used to support no action alternative or final disposition. This issue has not been settled between DOE and EPA.

A phased approach is acceptable, e.g., screening using Level III followed by resampling for verification using Level IV, as long as the approach is clearly defined.

Response: No response required.

Lists analytical levels III and IV for chemical analyses of ground. However, the Quality Assurance Project Plan (QAPP) lists only analytical levels I and III for analyses. The discrepancy between the two sections of text should be eliminated. The table should also address analytical levels for field measurements such as groundwater pH, turbidity, temperature, and specific conductance.

Response: Agree. Field techniques will be incorporated into the table.

The analytical levels (I and II) for analyses conducted in the field for worker health and safety monitoring and for screening of sediment and water samples should be included in Table 28.

Response: Agree that these measurements are Level I and II, but do not agree to include in the table. The data presented in Table 28 are for characterization of the site, not to address implementation issues. These issues are addressed more appropriately in the HASP.

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If NAPL is encountered it should be sampled and analyzed with analytical levels III and IV.

Response: Agree.

Field parameters (pH, conductivity, Do.O., Eh, Temperature) taken during groundwater sampling are level II.

Response: Agree when they are determined for a final analyses, but they are Level I when used for indication purposes.

Collection of sediments for chemical analyses or visual logging should include field Organic Vapor Analyzer, Photoionization Detector or Radionuclide Jar sample Level II analyses.
IT

Response: Disagree. This is an implementation issue and is covered in the HASP. These analyses would be Level I because they are generally non-specific and for screening, although the OVA can do some specific analyses.

140. WP-122, Table 28: The data quality objectives (DQO) should be related to specific analysis and particularly to groundwater parameters needed.
NUS

Response: Agree. The table has been modified to remove any indication that these are DQOs.

141. WP-122, Table 28, and SAP/QAPP-5, Sec 3.0: The table identifies analytical levels ranging from I to IV, depending on the data needs while the QAPP reflects either level II or level I will be used. These two sections appear to be in conflict. In addition, the QAPP states that levels will be "based on the criteria provided." How, when, where, and what is the basis for the criteria. Also, why repeat the Analytical Levels Tables in both sections?
RL

Response: Agree. The two sections will be made consistent. When revised, the text will present the analytical levels specified and not left to a later decision. The "Analytical Levels" table in the QAPP will be deleted.

142. WP-122, Table 28: Level V is not indicated for analysis of radionuclides as in previous work plans. Please explain.
IT

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Response: The level appropriate for radionuclides is still being decided. DOE and EPA must decide if they are Level III or Level V. DOE considers radionuclides standard analyses (Level III), while EPA considers them non-standard (Level V).

143. WP-122, Table 28: Measurement of flow/volume will be level I or II, chemical analyses of water from various sources will be level III or IV, radiological analyses will be level V.
IT

Response: Disagree in part, agree in part. Analytical levels apply only to chemical analyses, not physical measurements. The table will be modified accordingly. Agree with the rest of the comment but note the response to comment 142 with regard to Level V analyses for radionuclides.

144. WP-123, Sec. 4.1.2, Para. 4: Water samples are generally collected after soil samples. Therefore, if soils are to be archived, water samples will have to be collected and analyzed immediately to assure holding times for soils organic compound analyses are able to be met (holding times for Volatile Organic compounds are generally 14 days using EPA methods) if the soils need to be analyzed.
IT

Response: Agree with intent. Any soil samples collected for analysis will be handled in accordance with EPA-accepted holding times.

145. WP-124, should address analytical procedures precision, accuracy, representativeness, comparability, and completeness (PARCC). Individual PARCC parameters can be discussed in more detail in the Sampling and Analysis Plan (Attachment 1).
NUS

Response: Agree. A reference to Section 3.0 of the QAPP will be added. The PARCC parameters are discussed in detail in that section.

146. WP-126, Sec 4.1.3, P. 2, last sent: The last sentence needs clarification regarding the types of organic constituents which may require further study, and what methods of development/verification will be required.
IT

Response: Agree. The statement was meant to indicate that sorption/desorption work has been routinely performed with aqueous phase metals, but not so for non-aqueous phase organic compounds. Development of laboratory techniques may have to be developed for two-phase studies.

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147. WP-126, Sec. 4.1.3: An additional data quality effort should be to determine the acceptability of existing wells for CERCLA/RCRA purposes. Some justification for their use will be necessary if they do not meet the requirements of EPA's Technical Enforcement Guidance Document.
IT

Response: Agree. This is included in the first two bulleted items in this section. Because this is an important issue, a statement will be added to Section 3.1.3.2 where the wells were first identified.

148. WP-127: The sufficiency of the number of samples collected relative to statistical needs should be addressed.
NUS

Response: Agree with intent. A statement will be added to indicate that statistical techniques such as kriging will be applied to evaluate spatial distributions of contaminants and statistical comparisons of single well analyses to ARARs or other wells will be conducted.

149. WP-127, Sec 4.1.4, third sentence: The statement that conducting an RI/FS when a RI/FS is not required, will not result in any risk to human heath and the environment is not correct. Risks associated with conducting any RI/FS include health and safety risks associated with field operations such as thermal and cardiac stress, and physical hazards associated with drilling and sampling operations.
IT

Response: Agree. A statement will be added to reflect this fact.

150. WP-127, Section 4.1.4, P 2: It is a false statement that the contaminant concentration data and data on contaminant extent do not need to be to the same level of confidence as the data for demonstration of presence/absence of contaminants. Page WP-120, section 4.1 states: "Determining the contaminant concentration in the aquifer and the general water chemistry as a function of space (including different depths) is necessary to assess the technical feasibility, time periods, and cost of candidate remedial actions." Therefore a high degree of confidence is necessary to base decisions upon in the FS.
IT

Response: Agree. The statement will be deleted.

151. WP-128, Sec 4.1.4, P. 1, second bullet: Define the meaning of the term "interactive" as applied to indicator species and aquifer sediments.
IT

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Response: The term was meant to indicate reactions between the indicator species and sediments that lead to retardation of the materials as they are transported through the aquifer. The statement will be expanded to reflect this intent.

152. WP-128, Sec. 4.2.1.1, Para. 1: This paragraph implies that the only primary sources of groundwater contamination in the 300-FF-5 O.U. is 300-FF-1. Both 300-FF-2 and 300-FF-3 are likely to contain major sources as well.
IT

Response: Agree. These source operable units will be added to the statement.

153. WP-129: Should explain what is encompassed by "groundwater withdrawals" in the statement "determine contaminant concentrations in groundwater withdrawals in the 300 Area".
NUS

Response: There are two known uses of groundwater in the 300 Area--for the aquatics laboratory in the 331 Building and for irrigating pasture land south of the 331 Building (currently inactive) (Jim Choate, personal communication, 1989). These sources are not used for drinking. These groundwater withdrawals and others, if identified, will be monitored for contaminants.

154. WP-129, Sec 4.2.1.1, Task 4, Bullet 3: Reword or expand the fifth bullet to clarify the meaning of characterization of groundwater withdrawals.
IT

Response: Agree. See response to comment 153.

155. WP-129, Sec. 4.2.1.1, Task 5: A full suite of chemical analyses should be run to prevent a TYPE I error.
IT

Response: Agree. The statement will be changed accordingly.

156. WP-129, Sec 4.2.1.1, Task 5, P. 2: This paragraph states that surface-water/sediment sampling will be performed for indicator species. Section 4.1.2, pg WP-124, 2nd para., states that complete chemical analyses of spring and Columbia River water will be obtained. Correct discrepancy.
IT

Response: Agree. See response to comment 155.

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157. WP-129, Section 4.2.1.1: The second item under Task 7 is to determine the extent and concentrations of contamination in biota. This objective is not listed as such in Table 28 on page WP-122.
IT

Response: Disagree. It is listed in the second category from the bottom on p. 122.

158. WP-132, Sec. 4.2.4: The community relations plan has been written, commented upon and issued. We are operating under the guidance of that plan at this time.
IT

Response: Agree. That plan will be referenced.

159. WP-134, Sec. 5.3.2.1, Para. 1: The fence diagram (Fig. 8) or water table contour maps (Fig. 11-13) do not necessarily support the presence of an embankment. Need to address the importance of finding the embankment and breeches (i.e., define pathways to the Columbia River, Location were Dense NAPL may travel to Columbia River).
IT

Response: Partially agree. The exact location of the embankment and any breaches (if they exist) are inferred from mostly indirect evidence at the present time. The embankment is indicated in the fence diagram where the Ringold Formation rises above the water table at well 399-1-16C. The need to delineate this feature is already explained in the text; part of the rationale for additional geophysical surveys is to map this feature in the subsurface. See answer to comment 51.

160. WP-134, Sec. 5.3.2.1, GENERAL: A figure should be shown with the general locations of geophysical studies, especially seismic lines.
IT

Response: Agree. The approximate location of the geophysical studies will be shown.

161. WP-134, Sec 5.3.2.1: The rationale for using the various geophysical methods during the area-wide and paleochannel geophysical surveys is poorly presented. During the area-wide survey both ground penetrating radar (GPR) and acoustic reflection profiling are proposed, while GPR, acoustic reflection profiling, acoustic refraction profiling, and electromagnetic conductivity are proposed for delineating the paleochannel. If GPR and reflection profiling are not expected to work, why propose these methods.

Furthermore if one method does work, why continue to use each of the remaining methods. This section needs to be rewritten.
HAZWRAP

Response: Agree in part. The methods proposed may work and, in fact, could be very successful depending on the depth of the paleochannel surface and the amount of contrast between the layers. If one or more of the methods does not work, those methods will be discontinued and the geophysical study will continue only with those methods that are successful.

162. WP-134, Sec 5.3.2.1.1, last para: Please clarify why the base of the eolian deposits and layering of uppermost Hanford formation need to be determined. The need for completing operable unit wide ground penetrating radar is questioned. If groundwater levels are greater than the 25 - 35 ft maximum penetration depth, GPR will not provide any additional information of the water table configuration. If the GPR is for source detection, isn't it already part of the source operable unit work plans (300-FF-1, 2, 3). The need for operable unit wide GPR should be deleted.
IT

Response: Agree in part. Simply put the eolian deposits are "in the way". The layering of the Hanford formation is more important to the FF-1 and other vadose zone studies; however, there are areas where the Hanford formation thins and is underlain by shallow Ringold Formation sediments. It is these areas where we are primarily concerned with respect to FF-5 because these lower permeability sediments will influence the flow paths in the unconfined aquifer.

163. WP-135, Sec. 5.3.2.1.1, P. 1: There needs to be a referenceable procedure for each of the geophysical methods discussed in this section.
IT

Response: Agree. The work must be performed in accordance with written procedures. They are currently being written to the EII format.

164. WP-135, P. 2: Talks about the top of the paleoembankment being obscured by a thinner layer of gravel, "as discussed above". However, the paragraph above discusses how eolian sand deposits may make it difficult to achieve good acoustic coupling. Is this what the second paragraph refers to? If so, should correct. If not, should clarify.
NUS

Response: Agree. It should say a thinner layer of sand, not gravel.

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165. WP-135, Sec 5.3.2.1.2: Paleochannel definition is necessary and the use of surface geophysics useful, however, a phased approach should be used. The most promising methods should be tried first and if unsuccessful then proceed to the less promising.
IT

Response: Agree in part. At this time it is uncertain which methods will work best. Each method can contribute a portion of the picture or information desired; therefore all methods proposed should be attempted. See response to comment 161.

166. WP-136, Sec 5.3.2.2, P. 1, Sent 1: Task 2b states that 12 new wells will be drilled. Sections 5.3.4.1.1 refers to three nested wells at 12 locations, 36 wells. Section 5.3.2.2 should be clarified to state that 12 borings with three wells each will be installed.
IT, NUS

Response: Agree. Text modified accordingly.

167. WP-136, Sec. 5.3.2.2, Para. 1: Address the core method planned. Diamond core is not effective in unconsolidated material. Also, the Becker drill method will be used to the Ringold Formation, address the method of choice from the Ringold to the upper confined aquifer. Present which drilling and sampling methods were used in the past and how successful they were.
IT

Response: Accept. The diamond core method using a mud rotary rig will be proposed for the Ringold Formation, while the unconsolidated Hanford formation will be drilled with reverse air rotary (Becker) method.

168. WP-136, Sec 5.3.2.1.2, P. 1: The use of a brand name geophysical instrument is not appropriate in the Work Plan. Replace with technical specifications or simply use the name of the geophysical technique.
IT

Response: Agree. The generic name of the geophysical technique will be used.

169. WP-136, Sec. 5.3.2.2, P. 1: Justification for the placement of the wells shown on Figure 30 is needed. The wells appear to be placed essentially along flow lines, the reason for this needs to be explained and justified. Please provide the reasoning.
IT

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Response: The baseline characterization wells are roughly evenly distributed over the entire 300-FF-5 so as to provide representative characterization data for the entire operable unit.

170. WP-136, Sec. 5.3.2.2, Para. 2: Address what is meant by vertical anisotropy. For instance, are the gravels and sands anisotropic, or is the anisotropy due to clay or silt layers within the sands and gravels.
IT

Response: Accept. A phrase will be added to explain that vertical anisotropy is due to the interlayering of contrasting sediment types.

171. WP-136, Sec. 5.3.2.2, Para. 2: The level of vertical detail needed to model the system may be much less than five feet. A 0.5-1 foot low permeability layer (clay or silt) such as M-1 may be fairly continuous over the site. If so, it could greatly influence groundwater flow and NAPL movement.
IT

Response: Disagree. It is unlikely that mud layers <5 ft thick are very continuous beneath 300-FF-5. This is based on the new figure generated for this report which shows all but the M3 layer appear discontinuous across most of 300-FF-5. Furthermore, it is probably unrealistic to expect to be able to model layers less than 1 ft thick with the sophistication of models available and data required to drive them.

172. WP-137, Figure 30: Would be helpful to show the location of fence diagram (shown in Figure 8, page WP-33).
NUS

Response: Reject. This will be done by changing the location map on Figure 8. See response to comment 50.

173. WP-137, Figure 30: Hydrostratigraphy and groundwater movement distant from the contamination (at the extremities of the 300 area) are the major areas of study in this work plan. However, hydrostratigraphy and, hence, geohydrology, vary over distance, sometimes with significant ramifications.
NUS

Response: No response required.

174. WP-137 & WP-146, Sec 5.3.4.1.1, Figures 30 and 32: Figures 30 and 32 do not agree in regard to the number of wells. Include on Figure 30 the boring with two nested wells, and the five dense nonaqueous phase liquid (DNPL)

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monitoring wells. Include locations of the six large diameter test wells on both figures.
IT

Response: Disagree on Figure 30, agree on Figure 32. The purpose of Figure 30 is for delineation of the locations of drill core boreholes not monitoring wells. Only the 12 baseline wells will be cored, not the DNAPL and uranium wells shown in Figure 32. We agree that the likely locations of the six test wells should be added to Figure 32.

175. WP-138, Sec. 5.3.2.2.1, Para. 1: Only hard-tool drilling is described. Address the other potential drilling methods and their respective advantages and disadvantages. Some methods to evaluate may include air rotary, ODEX, Casing hammer.
IT

Response: Accept. A paragraph describing the advantages and disadvantages of the Becker and diamond core drill methods will be added.

176. WP-138, Sec. 5.3.2.3, Para. 1: Reference past work on using mineralogic analyses for determining sorption, etc. The information obtained form a detailed study will not be as useful as using larger scale tests (tracer) and analysis of plume movement data (such as the "spill" tracking described in a 300-FF-1 Draft)
IT

Response: Disagree. This section discusses techniques for characterizing the geohydrology and is not designed to provide an indepth discussion of sorption. This section is provided as support to geologic characterization.

177. WP-138, Sec. 5.3.2.3, Para. 2: Downhole cameras are useful in open holes. Most wells however will have to be cased through most of the Hanford and Ringold Formations to prevent caving of the borehole. A camera will be of little use here.
IT

Response: Accept. Downhole cameras will be used for troubleshooting and to check and verify well construction. Because of the casing, they can't be used to observe the formation. This will be clarified in the text.

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178. WP-138, Sec 5.3.2.3, last para: The geophysical tools used to interpret well stratigraphy should include gamma-gamma, neutron, and caliper tools. Add to list of geophysical logging tools.
IT

Response: Partially agree. The gross gamma log is the only calibrated log that's been approved by Westinghouse. Other logs, including the neutron-neutron and gamma-gamma methods will only be used if calibrated logging techniques are in place. Because the wells will be completely cased, a caliper log would be meaningless.

179. WP-138, Sec 5.3.2.3, last para: The term "gross gamma log" is assumed to mean natural gamma. If so, the same name should be used here as is used in the discussion of the development of hydrostratigraphy in Section 5.3.4.1.1, pg. WP-144, last para. Correct one or the other to be consistent.
IT

Response: Accept. "Gross gamma" will be changed to "natural gamma" to be consistent with other parts of the document.

180. WP-139, Table 30: Conducting aquifer tests at five-foot intervals in every hole is extreme. This is especially true in light of the disposal problems associated with the purge water issue. There needs to be some caveat associated with this desire to permit alteration from the proposed schedule.

Response: Agree. Aquifer tests will not be conducted at 5-ft intervals in every hole. In fact, aquifer tests will not be conducted in any boreholes, only in completed monitoring wells and test wells.

Blow counts require that some consistency of force be applied for even qualitative measure of penetration rate. At this time there is no procedure or other administrative method for demanding this consistency. Please provide the methodology by which judgment will be made concerning geologic interpretation of blow count data.

Response: Disagree. The penetration rate can be determined qualitatively by counting the blows required to advance the sampler 6 in. using a 140-pound hammer. This is specified in ASTM D 1586-84 and in Procedure DO-2 in PNL's Procedures for Ground-Water Investigations.

Seventh row of the table refers to "blow counts on drive band / split spoon sampler" as a field analysis method, but this type of sampling is not addressed or referred to in the text as a soil or sediment sampling method. Define when this method will be used, and for what purpose in the RI.

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Response: Agree. Because core-barrel techniques will be used only in the M3 and underlying sediments, this is not of concern. It will be deleted from the table.

Page WP-139, Section 5.3.2.3, Table 30: Neither continuous coring method nor Becker method will yield blow count data. Task 2b does not specify drive barrel or split spoon sampling, therefore entry addressing blow count data should be deleted from table.

Response: Agree. See response to previous part of this comment.

Aquifer Tests. The definition of isolatable unit is needed in text.
IT

Response: This phrase has been removed in response to other review comments. There is no need to define the phrase.

181. WP-139, Table 30: Need to define how aquifer tests will be preformed for every isolatable unit <5 feet when the well has a limited screen length. Furthermore, need to include that both slug and pump tests will be performed in the monitoring wells.

Response: Disagree and agree. Because each 5-ft interval will not be aquifer tested, we will not define how they will be performed (disagree). Instead, the information necessary for slug testing and aquifer testing will be added to Table 30 (agree).

Sediment sieving should also be used to determine the sand pack and screen size of the monitoring wells. At present the work plan does not include this operating procedure.

Response: Agree. Yes, sediment sieving will be conducted to determine the appropriate well screen or the need for channel pack well screen and the appropriate filter pack size.

A petrographic study is not warranted. Except for zeolites, sand size material do not have meaningful adsorptive/desorptive potentials.
HAZWRAP

Response: Disagree. The primary purpose for collecting these data is stratigraphic correlation, particularly for verifying the contact between the Ringold and Hanford formations; this is alluded to in the table. The sorption capacity of the sediments at Hanford is most definitely affected by mineralology, but it is probably more affected by

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the particle size of the sediments. Calcite is one of the predominate secondary minerals present and it greatly influences sorption.

182. WP-139, Table 30: Under the heading of "field contamination", are pH, temperature, etc. to be used for "safety", as indicated?
NUS

Response: The table will be modified to reflect that only pH, organic/toxic gases, and radiation will be used for safety.

183. WP-140 & WP-141, Table 31: The information for "Radionuclides" is repeated under "Hazardous Chemicals." Please correct.

Response: Agree. This will be corrected.

Permeameter - Diamond core samples are not truly undisturbed since drilling fluid comes in contact with the sample and may remove fines.

Response: Agree. Experience from BWIP work at Hanford showed that mud coring contaminated the outer surface of the core and did not penetrate beyond a thin layer. No sampling technique, including split spoon, is truly undisturbed because of smearing on the sides of the core. No change will be made.

Petrography - Address in text how the petrography of sediments will help in determining the hydraulic characteristics or contaminant distribution of the contaminated units.

Response: Accept. The following sentence will be added to the text: "The purpose of a petrographic analysis of the sediments is twofold: (1) to identify the major and minor mineral constituents to determine how these might interact with contaminants, and (2) for stratigraphic studies, particularly for verifying the contact between the Ringold and Hanford formations, which have distinct hydrologic properties."

Leaching/Desorption Tests - Drive-barrel, Becker hammer and diamond core drilling methods will drive off volatile organic contaminants during sampling. It is suggested to try a split spoon with sand baskets for sample collection in unconsolidated sands and gravels.

Response: Disagree. We have decided to use diamond core in the Ringold and split spoon or core barrel in the M3 and underlying sediments. No attempt will be made to obtain core in the Hanford formation.

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Hazardous Chemicals - Column 2 should read "Concentrations of non-radioactive compounds in groundwater. . . ." Also, sample collection needs to be done using undisturbed sample (split-spoon, Shelby tube, etc.)

Response: Agree. The table will be modified accordingly.

184. Page WP-140 and WP-141, Section 5.3.2.3, Table 31: Delete "D" and "S" entries from table as drive barrel and split spoon samplers are not addressed in text for Task 2b.
IT

Response: Disagree. For completeness, these methods should remain in the table because they will be used in this study for collecting drive barrel or split spoon samples in the M3 layer and underlying sediments.

185. WP-142, P. 3,4,5: Please define the number of samples targeted for analysis. Define the basis by which specific samples will be selected for analysis.
IT

Response: The last paragraph on WP-142 defines 30 samples for complete chemical characterization and 10 of these samples with the highest level of contamination for leach/desorption studies. This is a preliminary (i.e., likely minimum) number. Should more contamination sources and a wider range of constituents be found in the RI, additional characterization would be warranted.

The fourth paragraph on WP-142 defines the criteria. Those samples with the highest concentrations of readily measured (and indicator) constituents get flagged for complete analyses.

186. WP-142, P 4 & 6: Explain how sediment samples will be "selected". And what will determine whether it is "possible" to expel pore waters within sediments (i.e., when will this be attempted?) This should be addressed in the Field Sampling Plan (Attachment 1).
NUS

Response: Sediment samples that get selected for complete characterization will be those that yield high concentrations of indicator or readily measured constituents. Screening of most samples will involve the use of features such as stratigraphic breaks, proximity to known disposal facilities, proximity to known contaminant plumes, disparate moisture content, abnormal saturated paste pH, and abnormal appearance to make the first cut on what core material gets routine analyses for indicator and readily measured parameters.

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Sediments that are flagged for detailed analyses will be further categorized as to whether they appear moist enough to yield a pore water sample. Those that are moist will be pressure extracted using a compressed gas (N_2) driven stainless-steel filtering apparatus.

187. WP-142: Should present or discuss sources of existing chemical-specific data on leach and adsorption-desorption and distribution coefficients. Proposed tests should also be chemical-specific or may be of limited value.
NUS

Response: For sediments in the 300-FF-5 operable unit, there are no data on leaching or desorption. For Hanford site sediments, the available leaching/desorption data base for radionuclides and inorganic regulated chemicals are being documented in a review report. The report should appear in early 1990.

Disagree with the statement that the proposed leaching and adsorption/desorption tests should be chemical-specific. The tests should simulate what will happen when recharge waters (for vadose zone) and groundwater (for the aquifer sediments) percolate through the contaminated sediments. For remedial investigations using chemical reagents the tests should simulate in situ flushing/washing. The tests should attempt to accurately simulate the system and should be designed to not bias results (e.g., lose volatile organics) or cater to some specific species.

188. WP-142, Section 5.3.3: The standard Becker drilling method will not yield suitable samples for VOC and semivolatile analyses. Given the previously presented options of either Becker drilling method or continuous coring, please explain how suitable samples will be obtained.
IT

Response: If it is determined that volatile organics are a significant source of contamination in a specific region of the vadose zone or upper unconfined aquifer, sediment sampling procedures will have to be modified to minimize loss of volatiles.

189. WP-142, Section 5.3.3: The goal of the soil investigation, as stated in this section, includes characterizing the chemical content of the vadose zone. The vadose zone was not mentioned in Section 1.2, "Project Goals", nor on Table 28, "Data Quality Objectives". Section 3.1.2, page WP-61, states that the "areal and vertical extent of contaminants in the vadose zone sediments in the 300 Area will be ascertained during RIs for the

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300-FF-1, 300-FF-2, and 300-FF-3 operable units." A consistent approach to the scope of the 300-FF-5 RI is needed throughout this work plan.
IT

Response: Operable units 300-FF-1, 300-FF-2 and 300-FF-3 will drill boreholes within the perimeter of disposal sites and in adjacent areas as warranted. The purpose of boreholes drilled for 300-FF-5 are to characterize the groundwater system. If contaminants are encountered in the vadose zone during the drilling of such boreholes, they will be evaluated. This approach is consistent throughout the report.

190. WP-142, Sec. 5.3.3, Para. 4: Address definition of highly contaminated and who will decide which samples are to be leach tested.
IT

Response: At present, the logic is to choose 30 samples for complete chemical characterization. Of these, the 10 most contaminated would be subjected to leach/desorption testing. The principle investigator of soils/sediments will make recommendations to the technical manager of the RI work. If there are different types of contaminants but most of the highly contaminated samples come from one facility/source, the testing will be broadened such that all types of contaminants/sources are studied.

191. WP-142, Section 5.3.3, P. 6: Please indicate the criteria for determining "selected sediment samples."
IT

Response: Agree. The text will be modified to show that the 30 samples chosen for complete analyses will have these parameters measured. Also, samples at stratigraphic interfaces, samples with anomalous moisture content or coloration, or suspected proximity to sources of contamination would have some or all of the additional parameters measured.

192. WP-142, Sec 5.3.3: Need to define the rational and justification for collecting and selecting each of the 30+ sediment samples.
HAZWRAP

Response: Agree. The text will be modified to suggest that the 30 samples are a first round choice (i.e., likely minimum). If the first 30 samples are not adequate to determine the types of contaminants, their extent, and leaching/adsorption-desorption properties, additional samples will be studied.

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193. WP-142: There is insufficient soils testing information to deal with potential remedial alternatives (Tables 26 and 27, page WP-116), such as sheet piling.
NUS

Response: Agree. Any physical soil testing beyond those mentioned in Table 30 and 31 (e.g., penetration rate, particle-size, hydraulic conductivity, bulk porosity) that might be useful for remedial alternatives will have to be requested in later stages of the RI (i.e., during feasibility investigations). The site characterization activities described in Tables 30 and 31 are deemed to be adequate to perform preliminary remedial alternatives and endangerment assessments.

194. WP-143: The choice of monitoring locations should be addressed in the main body of the text and not left as a footnote to Table 1 (page SAP/FSP-6) in Attachment 1. Text should include explanation of the locations chosen for monitoring dense nonaqueous phase liquids and uranium (shown, for example, on Figure 32, page WP-146) and locations of large-diameter wells (page WP-147) and wells used for tracer sampling (SAP/FSP-7).
NUS

Response: Agree. An explanation will be added to the text on p. 144.

195. WP-143, Sec. 5.3.4, Para. 1: The goal of the 300-FF-5 investigation should be to assess the impact of waste disposal activities in the 300-FF-1, 300-FF-2 and 300-FF-3 O.U.'s on groundwater in the 300-FF-5 O.U.
IT

Response: Agree. The sentence will be changed to read: "The goal of the 300-FF-5 investigation task is to assess the impact of waste disposal activities in the 300-FF-1, 300-FF-2, and 300-FF-3 operable units on groundwater in the 300-FF-5 operable unit."

196. WP-143, Section 5.3.4, P 1: The "if necessary" clauses in the bulleted items (see descriptions of Tasks 4c and 4d) are not addressed in the text. Please explain the conditions when the listed determinations would and would not be necessary.
IT

Response: Agree and disagree. The "if necessary" clauses are inappropriate and will be deleted.

197. WP-143, Sec. 5.3.4, Task 4b: Please define to a greater extent what is meant by "determine distribution of....groundwater injection and withdrawal points." If this means some sort of well inventory, explain how will it be

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used. The data available in writing this work plan should already include the groundwater usage and/or disposal practices for the 300 Area. Please revise the plan to include this information.
IT

Response: Agree. Groundwater injection and withdrawal points will be deleted.

198. WP-144: Please clarify what is meant by "available" in "sediment samples will be available or archived".
NUS

Response: Clarification. The words "available or" will be deleted.

199. WP-144, Sec 5.3.4.1.1, P. 1, 2, 3, and also Page WP-149. - Text should state the number of wells to be installed in each phase of the groundwater investigation. A table showing phases and wells would clarify the situation. The discussion of phases on page WP-149 should be moved to page WP-147.
IT

Response: Agree and disagree. We agree that a table, summarizing the number of wells per phase, should be added to this section. We disagree with moving the discussion of phases from page WP-149 to page WP-147. The current heading location is more appropriate.

200. WP-144, Sec 5.3.4.1.1: Include within this section a statement about the prevention of aquifer cross-contamination within the same well. This is an important aspect when drilling through potentially contaminated into non-contaminated areas. A discussion of alternative drilling methods to prevent cross contamination is also applicable here.
IT

Response: Agree. A statement will be added about the prevention of aquifer cross-contamination within the same well. Drilling methods will also be discussed.

201. WP-144. Sec 5.3.4.1.1: The proposed methodology for installing monitoring wells should be modified. A single borehole with three 2-in. monitoring wells has a higher potential for contaminant migration between the various hydrologic zones. As such, single monitoring well boreholes are preferable.
HAZWRAP

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Response: Disagree. If properly constructed, a single borehole with three 2-in. dia. monitoring wells does not have a higher potential for contaminant migration between the various hydrologic layers.

202. WP-144, Sec 5.3.4.1.1: Include within this section a statement of how drilling fluid infiltration will be avoided or reduced and what types of drilling fluids will be used or acceptable.
IT

Response: Agree. A brief discussion of Becker air rotary technique and how drilling fluid infiltration will be avoided or reduced and what types of drilling fluids will be used or acceptable will be added.

203. WP-144, Sec. 5.3.4.1.1, Para. 2: It may be premature to limit lithologic sample collection to drill cuttings during Phase II. A more detailed definition of some minor units may be needed.
IT

Response: Agree. This sentence will be deleted.

204. WP-144, Section 5.3.4.1.1, P 2: The second paragraph identifies core barrel sampling.; This is inconsistent with the methods discussed in section 5.3.2.2.
IT

Response: Agree. Section 5.3.2.2 will be changed to indicate that core barrel techniques will be used to collect sediment samples from the M3 layer and underlying sediments in the boreholes drilled for the monitoring well nests.

205. WP-144, Sec 5.3.4.1.1, last para: The list of geophysical tools identified for stratigraphic analysis is different than those listed in section 5.3.2.3, pg. WP-138, last para. Make the two lists consistent.
IT

Response: Agree. Natural gamma logs are the only geophysical tools that will be used.

206. WP-144, Sec 5.3.4.1.1, last para: Are down-hole flow meters used in hydrogeologic characterization. If so, add to geophysical logging tool list.
IT

Response: Down-hole flow meters are not proposed for use in this RI.

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207. WP-144, Sec 5.3.4.1.1, P. 5: State what the proposed drilling methods for Phase II wells are. If undecided so state.
IT

Response: Agree. The proposed drilling methods for Phase II will probably be the same as the Phase I methods, but this could change based on the results of Phase I drilling.

208. WP-145, Fig. 31: Deep wells (confined unit) should be installed with pressure grouted steel casing placed into the M-3 unit or deeper. This would be drilled through and the well casing installed. The method will prevent cross-contamination from the unconfined unit. A few of the deep unconfined wells should be completed similarly.
IT

Response: Disagree. Previous experience drilling well clusters in the 300 Area without pressure grouting has not caused cross contamination. A far more important factor is the method of driving and the depth of driving the temporary casing into the M3 layer.

209. WP-145, Figure 31: Should explain the basis for using different materials for well construction (i.e., stainless steel vs FRE vs PVC) and the criteria to be used to select the appropriate material for each well installation.
NUS

Response: Agree. The objective of this groundwater characterization effort is to obtain "representative" groundwater samples that retain both the physical and chemical properties of the groundwater. Therefore, proper groundwater monitoring well design and installation techniques are necessary to minimize potential chemical alteration of samples. Much of the following discussion provides the background for selection of materials to be used in the RI and only selected portions will be added to the text of the Work Plan.

Most groundwater monitoring well design and installation problems can be traced back to a mistaken belief in a "cookbook" approach that ignores site-specific hydrogeologic, geographical, and contaminant-related conditions. The fact is that each monitoring well site is unique, requiring a unique design. The designer must develop well design and installation specifications that anticipate specific site conditions and accommodate changes caused by unanticipated drilling conditions.

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One of the most common monitoring well design flaws and installation problems is use of well casing or well screen materials that are not compatible with the hydrogeologic environment, the anticipated contaminants, or the requirements of the groundwater sampling program, resulting in chemical alteration of samples, and failure of the well to provide groundwater samples representative of formation conditions.

Unique site-specific factors should be the controlling criteria in the selection of monitoring well casing materials. Site-specific factors include the geologic environment, natural geochemical environment, anticipated well depths, and types of contaminants. Because no single casing material is applicable over the wide range and variety of natural and man-induced site-specific conditions, it is critical that these conditions be evaluated before selecting material for monitoring well casings.

Casing (pipe) used in monitoring wells conceivably could be made of almost any rigid tubular material, although experience dictates that the choices are limited to only a few materials. Casing materials typically used in groundwater monitoring wells can be categorized into four general types:

- thermoplastic materials, including polyvinyl chloride (PVC) and acrylonitrile-butadiene-styrene (ABS)
- fluoropolymer materials, including polytetrafluoroethylene (PTFE), tetrafluoroethylene (TFE), fluorinated ethylene propylene (FEP), perfluoroalkoxy (PFA), and polyvinylidine fluoride (PVDF)
- metallic materials, including carbon steel, low carbon steel, galvanized steel, and stainless steel (particularly types 304 and 316)
- fiberglass-reinforced materials, including fiberglass-reinforced epoxy (FRE) and fiberglass-reinforced plastic (FRP).

Each of these materials has physical and chemical characteristics that influence its use in site-specific hydrogeologic and contaminant-related groundwater monitoring. Polyvinyl chloride, stainless steel, PTFE, FRE, and ABS casing materials are discussed in greater detail in the following sections; other materials are infrequently used in monitoring wells, or there may be too little available information to warrant their selection for use in groundwater monitoring.

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The monitoring well casing and screen must have the structural strength to withstand the forces exerted on them by the surrounding geologic materials and the forces imposed on them during installation. The material should be able to retain its structural integrity for the expected duration of the monitoring program (approximately 50 years), under both natural and man-induced subsurface conditions. The three components of casing and screen structural strengths are tensile strength, compressive (column) strength, and collapse strength.

The tensile strength of a casing or screen material, defined as the load required to pull the casing apart, is the most significant strength-related property of casing or screen materials. For a monitoring well installation, the casing material selected should have enough tensile strength to support its own weight when suspended from the surface in an air-filled borehole. The maximum theoretical installation depth can be calculated by dividing the tensile strength for a given casing material by the linear weight of the casing. The tensile strength of the casing joints is more important because the joints are usually the weakest points. Therefore, the joint strength is commonly used to determine the maximum axial load that can be placed on a casing string.

The compressive strength of a casing or screen material is defined as the load required to deform the round casing by compressing it. The properties of the casing or screen parent material, specifically the yield strength and stiffness, are more significant in determining compressive strength than are the dimensional parameters, although casing wall thickness is also important.

Another significant strength-related property of casing or screen materials is collapse strength, or the capability of a casing to resist collapse caused by any and all external loads to which it is subjected, both during and after installation. The collapse strength of a casing material is proportional to the cube of its wall thickness. Therefore, a small increase in wall thickness provides a significant increase in collapse strength. A casing is most susceptible to collapse during installation, when the casing has not yet been confined and restrained by the placement of filter pack or annular sealing materials around it. Once a casing is properly installed and confined, its resistance to collapse is enhanced so that collapse is no longer a point of concern (NWWA/PPI 1980). The potential for temporary differential loading during completion in monitoring wells in the 300-FF-5 operable unit in the 300 Area is high, and the need for reasonably high joint tensile strength and collapse strength reduces the number of materials for further consideration. Therefore, thermoplastic materials and fluoropolymer materials will not be considered further.

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In general, stainless steel is superior to fiberglass, PVC, or Teflon® in all strength categories (collapse, tensile, joint tensile, and column strength) for materials of an equal thickness. However, stainless steel has a greater density and thus is much heavier. Fiberglass-reinforced epoxy casing is almost as strong as stainless steel casing and is only a fraction of the weight of stainless steel. Although fiberglass-reinforced epoxy casing has not been commonly used for constructing monitoring wells, its light weight, strength, and durable properties make it desirable.

Casing and screen chemical resistance and potential interference are also important concerns. Materials used for monitoring well casings must be durable enough to withstand potential chemical attacks from either natural chemical constituents or contaminants in groundwater; in particular, casing materials should be resistant to corrosion (galvanic or electrochemical) and chemical degradation. Typically, metallic casing materials are most subject to corrosion, and plastic casing materials are most subject to chemical degradation. Because the extent to which chemical attacks occur is primarily dependent on the presence and concentration of certain chemical constituents in groundwater, the casing material can be selected only with a knowledge of existing or anticipated groundwater chemistry. Not only may natural or the man-induced groundwater chemistry affect the structural integrity of monitoring well casings, but by-products of casing deterioration also may adversely affect the chemistry of water samples taken from monitoring wells.

Materials used for monitoring well casing and screen must not assimilate chemicals from the groundwater by adsorption to the material surface or by absorption into the material matrix or pores, and these materials must not desorb or leach chemical constituents from the well casing or screen into the groundwater to be sampled. Loss of chemicals from the groundwater may create "false negatives," and the addition of leached or desorbed chemicals may produce "false positives" that indicate possible groundwater contamination. Therefore, in the selection of monitoring well casing materials, the potential interactions among the casing materials and the natural and man-induced geochemical environments must be considered.

Studies of absorption and desorption of organics conducted in laboratory experiments on coupons of stainless steel, PVC, epoxy fiberglass, ABS, and several fluorocarbon materials indicated that stainless steel showed the least absorption and that PVC was second, fiberglass third, but most of the materials would have a minimal effect on sampling results if adequate purging were performed (Gillham and O'Hannesin 1989). Other

laboratory studies of the adsorption of volatile organics and trinitrotoluene indicated that adsorption was a small factor (Parker and Jenkins 1986; Miller 1982). A field study indicated that, for nonreactive compounds, purging procedures and transmissive formation properties were far more important than casing material properties (Robin and Gillham 1987). Other field studies demonstrated that if purging and sampling were to take place in the same day, the adsorption bias would probably not be significant (Reynolds and Gillham 1985). The importance of minimizing contact time with materials to minimize adsorption and leaching effects has been noted previously (Barcelona et al. 1983). Published data are limited regarding adsorption of chemicals onto fiberglass-reinforced epoxy casing and leaching of constituents; however, a few studies indicate this material is relatively inert in most monitoring environments (Hunkin et al. 1984, Gillham and O'Hannesin 1989). Some adsorption of volatile organic compounds occurs with casing and screen materials composed of commercially available epoxy fiberglass, but this adsorption does not have a significant effect on water samples if proper purging and sampling are performed (Gillham and O'Hannesin 1989).

Stainless steel is one form of metallic well casing commonly used to construct monitoring wells. Other metallic products are available for specialized purposes and conditions. Types 304 or 316 stainless steel materials, commonly used in monitoring wells, are part of the 18-8 or 300 series of stainless steels, generally considered among the more corrosion-resistant types. Both types are available in low carbon forms, designated by an L after the number (e.g., 304L and 316L), which are welded more easily than the normal carbon types. Both 304 and 316 contain the same amount of chromium, but type 316 has a higher nickel content (replacing an equivalent percentage of iron) and from 2% to 3% molybdenum.

The 316 composition has a greater resistance than 304 to sulfur-containing species as well as sulfuric acid solutions; however, its resistance to oxidizing acids is less than that of 304 (Barcelona et al. 1983). The resistance to corrosion of both types can be improved by treatment with nitric acid and potassium dichromate solutions. These treatment processes, usually done at steel mills or factories, are referred to as Mil-Spec QQ-P-35, etc. The passivation of stainless steel includes pretreatment procedures (Mil-Spec 5002) that substantially increase corrosion resistance in groundwater with high concentrations of halides in solution. Passivation may also be important for reducing adsorption of certain radionuclides if a hazardous waste site contains mixed waste (Raber et al. 1983).

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The five basic types of corrosion in stainless steels are general, galvanic, pitting, intergranular, and stress-corrosion cracking. In groundwater environments, galvanic corrosion, in which passive (cathodic or noble) stainless steel casing will give up metal to the surrounding solution, is one of the most important. Cathodic protection is achieved by supplying electrons to the stainless steel casing, accomplished by providing a direct current source or by using an anodic material (e.g., an anodic magnesium block) buried below the water table. One or more of several conditions may cause corrosion of carbon steel casing: a pH less than 7.0; dissolved oxygen content greater than 2 mg/l; more than 1 mg/l hydrogen sulfide; total dissolved solids (TDS) greater than 1000 mg/l of water; carbon dioxide greater than 50 mg/l; and chloride greater than 500 mg/l. Unlike carbon steel, the severity of the corrosion problem for stainless steel depends primarily on pH, TDS, and chloride or fluoride in the water at much higher concentrations than noted for carbon steel. Exposure to corrosive conditions in the upper confined aquifer and the bottom of the unconfined aquifer in the 300 Area may have caused corrosion and subsequent contamination of water samples by chromium in the 300 Area (Smith August 1987, Smith November 1987). Insoluble halogen and sulfur compounds may also form and not show in the water samples. Appropriate cathodic protection can be provided for stainless steel wells if the chemistry of the soil and water media are known.

The preceding discussion on chemical interference relates to situations in which the casing material is in contact with the saturated portion of the subsurface. For materials that is not in contact with the saturated zone, the arguments regarding chemical attack and sorption/leaching phenomena are generally not relevant. Thus, it may be possible to use less chemically resistant or chemically inert casing materials in the unsaturated zone, coupled with a more chemically resistant/inert material in the saturated zone.

For the 300 Area the best choice would be passivated, 304 stainless steel, wirewrap well screen or channel pack screen in the bottom of the unconfined aquifer or the upper confined aquifer because of the fine grained sediment in those intervals and the potential for anomalous chromium results. To meet structural strength needs either stainless steel or fiberglass reinforced epoxy casing could be used for any of the proposed monitoring wells. To meet joint tensile strength needs the configuration of the square flush-threaded couplings should conform to ASTM designation F480-88a (Foster 1989).

210. WP-146, Figure 32: FF-1 comment 293 discusses the need for additional monitoring downgradient of Burial Grounds 4 and 5, based on direction of

groundwater flow during periods of high groundwater. This question was deferred to FF-5. Please address.

The dense NAPL wells should be placed down stratigraphic dip (Layers M-1 or M-3) from source areas. It is likely the DNAPL could migrate opposite the direction of groundwater flow if the dip of a perching unit forces the DNAPL in that direction. A confined aquifer well may be needed near well 399-1-10B to determine if water levels at 399-1-18C are due to groundwater communication between the unconfined and confined aquifers in the borehole or through layer M-3.
IT

Response: Disagree. Burial Ground 5 already has well 399-1-10, which is downgradient of this burial ground most of the year. Also, a second well (399-1-10B) screened in the bottom of the unconfined aquifer is proposed for Phase I installation to monitor for DNAPLs near existing well 399-1-10. Currently, Burial Ground 4 does not have wells that can be clearly identified as being downgradient because of the groundwater mound near the process trenches. Once discharge to the process trenches ceases in December 1992, well 399-1-15 and 399-1-6 will be directly downgradient of Burial Ground 4. In the meantime, there are no wells directly downgradient; that is, west and east or southeast of this burial ground. Because of the groundwater mound at the process trenches, flow may be diverging both westward and eastward. Effective placement of a new well or wells would be difficult at this time. However, if a well is not constructed in Phase I during late 1990, then it will not be constructed until late 1991 in Phase II. If the monitoring well were constructed in Phase II, it would only be useful as a downgradient monitoring well for about 9 months before shutdown of the process trenches; therefore, we have not proposed installing a monitoring well east of Burial Ground 4.

There is no need for a confined aquifer well immediately adjacent to proposed well 399-1-10B to explain the intercommunication in well 399-1-18C with the confined and unconfined aquifers. First of all, there is no evidence of a natural or artificial (e.g., a pathway created during drilling) vertical, hydraulic interconnection between the unconfined and confined aquifers at or in the vicinity of well 1-18C. In fact, there is no evidence of any appreciable hydraulic interconnection between the unconfined and confined aquifers anywhere in the 300-FF-5 operable unit except at well 1-16D. The water chemistry in well 1-18C is equivalent to that found in the confined aquifer, but it is in hydraulic equilibrium with the unconfined aquifer for the reasons presented herein. Well 1-18C is completed in what would be best described as a unique portion of the unconfined aquifer compared to confined aquifer

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wells such as 1-17C shown in Figure (new schematic). Like most wells screened in the confined aquifer, well 1-18C is screened below layer M3; however, it is underlain by the Goose Island basalt flow, not the Martindale basalt flow. Apparently, groundwater from the confined aquifer slowly flows from the Martindale basalt upward through the Goose Island basalt and into the gravelly sand above the Goose Island. Because the hydraulic gradient is upward from the Martindale basalt flow, the water chemistry in well 1-18C is the same as well 1-17C. The hydraulic head is lower in 1-18C for two primary reasons: (1) most of the hydraulic head is lost overcoming the resistance to upward flow as the groundwater flows through the dense columnar basalt of the Goose Island layer; (2) layer M3 is not as thick as in most of FF-5 and therefore the remaining confined hydraulic head is lost when the hydraulic head in the gravelly sands at well 1-18C equilibrated with the hydraulic head in the unconfined aquifer. Also, it is believed that the M3 layer truncates a few tens or hundreds of feet north of 399-1-18C.

211. WP-147 & WP-156: What is the geologic/sedimentological composition of the islands in the Columbia river? Are they river gravels? If so, can they be continuously cored?
NUS

Response: Clarification. The sedimentological composition of the islands in the Columbia River are probably predominantly gravel, but no specific data are available. It is likely that good cores will not be possible until consolidated sediments (Ringold) are encountered.

212. WP-147, Sec 5.3.4.1.1, P. 2: No proposed locations are given for the six large-diameter test wells. Provide the proposed locations on map.
IT

Response: Agree. The proposed locations of the test wells will be indicated on Figure 32 of the work plan.

213. WP-147, Sec. 5.3.4.1.2: This discussion does not justify or explain the geophysical surveys that are proposed. Please provide reasoning for selection of techniques to be used. In addition provide an description of how these survey data will be interpreted to provide the information stated as being necessary.
IT

Response: Agree. This was done in Section 5.3.2.

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214. WP-149, Sec 5.3.4.2, P. 1: Data Quality Objectives on Table 28, page WP-122, do not include soil gas survey data. The method used to analyze the soil gasses must be given, such as field GC or photoionization detectors.
IT

Response: Agree. Soil gas analysis will be added to the methods for chemical analysis of aquifer sediments. Level II will be added to the analytical level column. The method will be GC/FID/EC/PID using a mobile laboratory unit.

215. WP-149, Sec. 5.3.4.2, P. 2: Please provide an initial approximation of the number of wells anticipated for Phases II and III. At this point there is no means of planning for resources to accomplish the work. This planning effort will be essential due to the shear volume of RI/FS projects being conducted at a single time.
IT

Response: Agree, but we cannot because the results of Phase I are not known and, therefore, to specify the number of wells would be speculation.

216. WP-149, Section 5.3.4.2, P 2: Per Section 5.7, page WP-192, Phase III is to be a detailed analysis and comparison of each remedial alternative. Phase III is to be performed after acquisition of all necessary site characterization data. There appears to be a contradiction as Section 5.3.4.2 states that wells will be constructed during Phase III "to provide geohydrologic, contaminant background, and contaminant migration data." A consistent approach as to the sequence of activities is needed. See also page WP-156, Section 5.3.4.2.
IT

Response: The reviewer has jumped between phases of the RI and FS. This should not be done.

217. WP-151, Sec. 5.3.4.2, P. 1: A commitment was made in the response to FF-1 comments (65) to provide, in the FF-5 Work Plan, an analysis of which wells would be used for background water chemistry along with several other issues. These commitments are not entirely met in this discussion. Please address.
IT

Response: Disagree. The original comment was by a HAZWRAP reviewer, who indicated that modifications to the 300-FF-1 approach could make near field monitoring of 300-FF-1 acceptable; however, the installation of upgradient wells first, such as proposed in the 300-FF-5 Work Plan,

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would be a more technically defensible approach. This information could then be used to fashion the approach to downgradient installations in Phase II.

218. WP-151, P. 3: The Work Plan proposes a single sampling round consisting of 93 wells for a comprehensive suite of analyses. Based on experience with the "Hanford rate" of groundwater sampling, please provide assurance that the derived data will be time equivalent. In addition provide the methodology that will be used to tie this single round of analyses back to the time series analyses available from the RCRA program. In a situation where groundwater flow directions may change daily if not hourly, it seems remiss to propose only a single sampling without detailed justification.
IT

Response: Agree. A single sampling round is no longer proposed. Quarterly sampling of a subset of wells will be added to the Phase I sampling.

219. WP-151, P. 3: Throughout the work plan the discussion of wells vs. piezometers vs. borings vs. multi-level wells causes confusion. Consistency in reference to these assorted means of monitoring the groundwater is essential. Please provide and use a consistent, defined nomenclature for these groundwater monitoring structures.
IT

Response: Agree. A well is a structure completed in the saturated portion of the system from which water can be withdrawn. Wells are completed within a "boring" and sediment samples are collected from a boring. Piezometers are individual tubes installed in a single boring and are generally used for water-level monitoring. Multilevel wells will be deleted from the report.

220. WP-151, Section 5.3.4.2, P 3: Please specify the criteria for evaluating adequacy of existing wells for inclusion in the 300-FF-5 groundwater sampling network.
IT

Response: Agree. This is discussed in general terms in the section.

221. WP-151, Sec. 5.3.4.2, Para. 5: 43 new monitoring wells are mentioned here, however, 36 are mentioned in Sec. 5.3.4.1.1, Para. 2.
IT

Response: Agree. Page 14 is incomplete. The beginning of paragraph 1 of Section 5.3.4.1.1, paragraph 2, the first 2 sentences will be deleted

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and the following will be inserted: "During Phase I, 43 new monitoring wells (see Figure 32) will be installed within the 300-FF-5 operable unit to augment the existing monitoring wells. The first 36 wells will be nested wells with 3 wells in each of the 12 large diameter boreholes."

222. WP-151, Sec. 5.3.4.2, Para. 5: Reader is unable to make this judgment without knowing the known distribution of the organic contaminants.
IT

Response: Disagree. Little is known about the extent of DNAPLs at the bottom of the unconfined aquifer. That is why 5 wells will be installed specifically to determine their extent near the most likely sources in 300-FF-1. Also, there will be 13 additional wells (12 baseline wells and one uranium well) screened in the bottom of the unconfined aquifer to determine the extent of DNAPLs in the aqueous phase. To enable the reader to better understand the placement of these wells, a figure of the upper surface of the M3 layer will be added to the Work Plan. Organics are not present in the upper confined aquifer except where leakage has occurred near well cluster 399-1-16C. Organics in the top of the unconfined aquifer are well known near the process trenches and immediately downgradient, but little is known about other areas in 300-FF-5. Therefore, baseline wells have been proposed at the locations shown.

223. WP-151, Sec. 5.3.4.2, Para. 5: Explain how wells 13A,B will be able to differentiate the two uranium plumes when the well is over 1,000 feet upgradient from the southern-most plume
IT

Response: Clarification. Wells 13A,B and 6A,B will help define the horizontal extent of each of the uranium plumes by providing essential data in a large area (200 acres) where there are no monitoring wells. This area is near current wells where the isotopic ratios of uranium begin to change from normal to enriched.

224. WP-152, Sec 5.3.4.2, Table 33. Review of target compound list the associated CAS numbers revealed the following errors:

- "1,2-Dichloroethane (total)" should be 1,2-Dichloroethene (total)
- Chloroethane CAS number "73-00-2" should be 75-00-3
- Carbon disulfide CAS number "74-15-0" should be 75-15-0
- trans-1,3-Dichloropropene CAS number "10061-02-6" should be 542-75-6
- bis(2-Chloroisopropyl)ether CAS number "108-60-1" should be 39638-32-9

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- "Benzo(s)pyrene" CAS number 50-32-8 should be Benzo(a)pyrene

and inconsistencies including:

- CAS number 10061-10-5 corresponds to 1,3-Dichloro-1-propene(Z)-form not "cis-1,3-Dichloropropene"
- CAS number 10061-02-6 corresponds to 1,3-Dichloro-1-propene(E)-form not "trans-1,3-Dichloropropene"
- CAS number 50-32-8 corresponds to Benz[e]acephenanthrylene or 3,4 Benzofluoranthene, no reference was found to Benzo(b)fluoranthene."

IT

Response: Agree. Errors noted will be corrected. It should be noted that the comment is inconsistent between the sixth and ninth "errors."

225. WP-155, Table 33: Should presumably include all contaminants of concern identified in Table 22 (page WP-109). Some (e.g., cobalt 60, uranium 235 and 238, and 1,2 dichloroethene) appear to be missing. Also, text on page WP-151 indicates that if >5 ppb uranium is detected, sampling will address U234, U235, U238, and where possible, U236. This should be included in discussions of analyses, for example, Table 33 (perhaps as a footnote).
NUS

Response: Agree. These constituents are in the table in the form of gamma scan and uranium isotopes. 1,2-dichloroethane is present by correction of error noted in comment 224.

226. WP-156, Sec. 5.3.4.2, Top P., last Sen.: The TPA has no schedule for submittal of the FF-3 OU Work Plan. At this point it seems inappropriate to detail specific work to be done at some time in the future. If this effort is important, it had best be done here.
IT

Response: Disagree. Determination of the exact source in the vadose zone is beyond the scope of 300-FF-5.

227. WP-156, P. 1: Should explain why "if the leak is one lateral, then only one isomer will be seen; however, if the leak is in the mainline, then only tracers from upgradient incoming lateral lines will be detected". This is somewhat cryptic.
NUS

Response: Disagree. The discussion is cryptic, but adequate.

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228. WP-156, Sec 5.3.4.2, P. 2, 3rd sent: Large diameter test wells are part of the Phase I program in 5.3.4.1.1, pg. WP-147, 2nd para. Correct discrepancy.
IT

Response: Agree. This sentence will be deleted.

229. WP-156, Sec 5.3.4.2, P. 3: The discussion of distant wells should focus more on the remote possibility that contaminants have entered the upper confined system. Tracing this system beneath the Columbia River may have limited validity but the topic should be raised here.
IT

Response: Disagree. Sufficient discussion has been presented on the upper confined aquifer.

230. WP-156, Sec. 5.3.4.3, P. 1: A series of tracer tests are proposed, yet the distances between wells is such that successful completion of these tests is in serious jeopardy. This problem was discussed in FF-1 comment 305 and remains a valid concern here.
IT

Response: Disagree. Based on monitoring data from historical spills and releases of PCE, uranium, and chloroform from the process trenches into the unconfined aquifer, the success of the tracer tests is virtually guaranteed.

231. WP-157, Sec. 5.3.4.3, P. 2: The use of radio-telemetry to provide the water-level data to the project office is of questionable value and appears to be an overkill. General experience has shown that within reasonable travel distances it is more economical to use manual dumps of data from data loggers on a weekly to bi-weekly schedule. Periodic loss of radio equipment may result in the loss of this important data. Additionally, it is not particularly important for the reviewer to know the manner in which the data will be transferred from the field to the office, but it is important to know the frequency, accuracy and precision of the measurements being taken.
IT

Response: Disagree. General experience may have shown that it is more economical to use manual dumps of data from data loggers on a weekly basis, but our cost records on the RCRA program indicate that the cost of such an effort for one year would far exceed the cost of all of the radio telemetry systems. When the first year long data collection is over, twenty of the 30 radio telemetry systems and their data loggers/transducers can be used at other operable units. If the data is collected manually from the data loggers another large budget will be

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needed to collect data at the next operable unit, and more funding for collecting data at the 10 data loggers remaining in the 300 Area. Manual collection using electric sounders or steel tapes can cost easily $10.00 per measurement, whereas an automated system using telemetry can cost as little as $.03 per measurement. Data can be lost during manual collection. Experience has shown that data are lost more often by data logger malfunction or transducer failure, and rarely during transfer of data by radio telemetry. The precision, accuracy, and frequency of measurements are stated in the text.

232. WP-157, Sec 5.3.4.3, P. 3: This paragraph discusses only two surface water monitoring stations while Section 5.3.5.2, pg. WP-162, 2nd para. will use 3 stations. Correct discrepancy.
IT

Response: Agree. The reference to three river stage recorders on page WP-162 will be changed to two.

233. WP-157, Sec. 5.3.4.3, Para. 3: The water level monitoring is somewhat excessive. It would be valuable to do similar monitoring at a few wells to help determine the relative interconnection of aquifers with the river and each other. Also, in terms of actual remediation of the groundwater, the purpose of investigating 300-FF-5, the daily and weekly cycles are probably of limited value when compared with the annual fluctuations.
IT

Response: Agree in part; disagree in part. A few wells have already been used, but a more comprehensive set of data is needed for one year to defensibly reduce the number of wells and frequency of water level monitoring appropriate for the 300 Area, and provide essential data for interpretation of the tracer test data.

The daily and weekly cycles are probably of limited value for actual remediation; however, it is essential to have a frequency of water level monitoring that is more frequent than the frequency of change to determine the relative importance of the change and the nature of the hydraulic relationships between areas in the aquifers and the river. For example, without hourly, daily, and weekly data, it cannot be determined that the highest value of one day, week, or season is being compared to another high, median, or low value. If the position on the cycle is not known, then it is possible that the lowest low of a daily value during a high water level period may be compared to the highest high of a low water level period. Thus, if the highest high water level is slightly above the lowest low, the interpreter may conclude that the high water level period is actually the low level period and vice versa.

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234. WP-157, Sec. 5.3.4.3, Para. 4: Define "significant contamination" and explain the reason different test methods are to be used.
IT

Response: Agree. The sentence will be changed to indicate that drinking water standards are the criteria used to determine the type of test conducted. This is due to purge water disposal issues.

235. WP-157: Which wells are the 20 "selected" wells referred to. If these are to be determined later, should explain the basis for the selections.
NUS

Response: Agree. The following is a revision of the first two complete paragraphs on page 157. The two paragraphs have been expanded to three. "During all three phases, water levels will be measured in wells to determine hydraulic head in three dimensions across 300-FF-5.

Water levels at 30 selected well locations and two river-gauging stations will be monitored continuously (hourly) for one year following completion of all of the Phase I monitoring wells to determine the interrelationship between the groundwater and surface water (Columbia River). Water levels in wells near the river are highly correlated with river stage. An understanding of the rate and magnitude of water level change enables water levels to be predicted and consequential variation in contaminant migration pathways to be determined. Hourly measurements are excessive for predicting contaminant pathways (measurements every 2 hours would be adequate for interpretation); however, they are essential for calculating hydraulic properties using wave propagation. Ten of the 30 wells used during the first year and two surface water stations will continue to be monitored approximately every 2 to 4 hours for the next three years to allow for prediction of contaminant pathways and interpretation of observed concentration distributions.

There are three very important time scales of variability in the Columbia River. These include: 1) daily variations associated with power production at Priest Rapids dam, 2) weekly changes associated with power production which reflect the business cycle needs, and 3) seasonal variations associated with highly regulated discharges of the upper Columbia River system to meet irrigation, flood control, and fishery conservation goals. There is a fourth, and less important time scale, involving the natural hydrologic cycle. The natural hydrologic variability of the river system now occurs over a period of several years, and represents only a very small percentage of the variability in river stages. Although daily cycles can have some impact on pathways

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and travel times near the river, the effect is attenuated substantially a half mile inland. Therefore, emphasis on delineating groundwater flow patterns in relation to river stage will focus primarily on weekly and seasonal variations in water levels. Each well will be equipped with a multiple channel data logger and 1 to 3 transducers (3 for nested wells). Each data logger will be equipped with electrical solar panels for recharging batteries, and a radio telemetry system for transmitting the data to the project office. This data will be evaluated to obtain data sets of sufficiently large time steps useful for interpretation and predicting future contaminant migration or the effectiveness of cleanup methods. The vertical accuracy of each unit will be to within 0.06 ft of the actual water level elevation, this includes the 0.04 ft caused by inaccuracies in the vertical surveys. Therefore precision will be 0.02 ft."

The 30 selected well locations will include the four existing well clusters, the 12 new monitoring well nests, 2 dual well cluster locations (1-10 and 1-14) near the process trenches, and 12 well locations distributed throughout the central and eastern portion of the 300-FF-5 operable unit with 6 of the wells concentrated near the river (wells 1-1, 2-1, 3-1, 3-9, 4-7 and 4-9, and the other 6 wells (S27E14, 3-12, 4-1, 4-11, 5-1 and 6-1) farther from the river. The vertical distribution of the 68 monitoring points includes 16 in the confined aquifer, 18 in the bottom of the unconfined, and 34 in the top of the unconfined aquifer.

236. WP-158: How representative of the east side of the 300 area will a pump test in the western half of the site be if the geology is variable (page WP-158)? And, why install wells with three levels when most of them are to be outside the area of known contamination (page WP-158)?
NUS

Response: The aquifer tests with test wells to be conducted in the west side are to determine the aquifer properties on the west side, not the east side. Several pump tests have already been conducted on the east side, but none have been conducted on the west side of the 300-FF-5 operable unit. Also, the tracer tests and wave propagation tests will provide additional data about the aquifer properties on the east side. Other areas of potential contamination under all three vadose zone operable units must be investigated.

237. WP-158, Sec. 5.3.4.3, P. 2: With reference to the "six large-diameter test wells", a definition of what is meant by large is necessary. More than likely the casing diameter is a factor of pump capacity for the aquifer

tests. Estimated discharge rates should permit development of the definition of "large".
IT

Response: Agree. The following sentence will be added: "It is estimated that the large diameter wells will be approximately 16 to 20 inches in diameter to allow pumping of 500 to 2,000 gallons per minute."

238. WP-158: Why wait until Phase 3 to try to determine "amount of intercommunication between the aquifer and the river ". Also how does this "Phase 3" correspond to phases of the RI and FS?
NUS

Response: Disagree, but will clarify. The wells to be installed in Phase III will be used to (delete the word determine) "provide additional information regarding..." Phase III of the RI will be completed prior to production of the final RI report, or not conducted at all.

239. WP-158, Sec 5.3.4.4: Should define which wells will be pump tested and/or slug tested.
HAZWRAP

Response: Agree. They will be plotted on Figure 32.

240. WP-159, Sec 5.4.3.4, P. 1: It is unclear how the new borehole would assure that the aquifer is isolated if the abandonment procedure of 3-1-16c is unsuccessful. Please expand and clarify. It may be necessary that an EII or similar procedure be developed and implemented to cover this possibility.
IT

Response: Agree. The following sentences will be added to the last paragraph in section 5.3.4.4. on page 159 of the Work Plan: "The borehole should be drilled adjacent to wells 1-16C and D to a depth of 180 feet. A cement seal should be set opposite the M3 layer with a steel casing liner prior to penetrating the last 20 feet of the borehole. After the cement seal has set, the well should be deepened to 180 feet. A tremie pipe with an inflatable should be lowered to near the bottom of the casing opposite the M3 layer and the packer inflated. Grout should be pumped under pressure through the tremie pipe to seal off about one acre of the upper confined aquifer. This method does not require sealing the vertical pathway through the M3 layer along the

broken casing near well 1-16D because the grouting reduces the upper confined aquifer hydraulic conductivity to that of layer M3."

241. WP-159, Sec. 5.3.4.4, Para. 2: The abandonment procedure is confusing. Sealing the screened interval of the confined aquifer may not seal a leak within the annulus. The second attempt would be a boring set with a packer. Would the boring overdrill the casing? If so, how? A boring inside the casing would be of little value.
IT

Response: Agree. See response to comment 240.

242. WP-160, Section 5.3.5: The fourth phase referenced in paragraph 4, sentence 6 could not be found.
HAZWRAP

Response: Agree. This will be changed to three.

243. WP-160, Sec. 5.3.5.1: It is unclear what potential use the river gaging data from Ice Harbor Dam on the Snake River will have on the FF-5 study. Please provide the justification for the analysis of these data.
IT

Response: Agree. Reference to river stage at Ice Harbor Dam will be deleted.

244. WP-160: Should be more specific about what boundary conditions are needed (head? flux?) and in what detail (every 100 feet? mile?).
NUS

Response: Specifics regarding the boundary conditions for the modeling of the ground-water/surface-water interface are provided in Section 5.3.5.6.

245. WP-161, Sec. 5.3.5.2, Para. 1: It would be useful to place one or two well clusters near springs and seeps to monitor water quality during low and high water as well as vertical hydraulic gradients near the river.
IT

Response: Agree. With the existing wells and the new wells drilled, there will be sufficient head data along the river.

246. WP-161, Sec. 5.3.5.2, P. 2: Groundwater on the Franklin County side of the river is impacted by infiltration of irrigation water and the water is chemically altered by agricultural chemicals. Use of groundwater chemistry

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data may well result in the loading of the evidence in favor of Hanford. Something more realistic should be applied but this reviewer is unsure as to what that "something" is.
IT

Response: Samples collected from seeps on the Franklin County side of the river will be used to identify sources of contaminants entering the river along 300-FF-5 which are not associated with the operable unit. There will be no comparisons made to create a favorable image of the Hanford ground water versus the offsite ground water. These data will be necessary for the interpretation of downstream river water samples which may or may not be impacted by the ground water from either side. That is, it would be incorrect to implicate the 300-FF-5 operable unit for those contaminants associated with the agricultural sources and not 300-FF-5.

247. WP-161: Please explain the usefulness of collecting water samples from springs across the river. How will they be used to identify "potential sources of pollutants entering the river along the operable unit"?
NUS

Response: See response to comment 246.

248. WP-161: It is stated that "sample results" will be compared to "drinking water standards". Please discuss the purpose. If there are no drinking water standards for a constituent, what other criteria (water quality standards, for example, or ARARs) will be used?
NUS

Response: Accept. Text modified to "applicable ARARs."

249. WP-161, Sec 5.3.5.2, P. 2, Sent 2: The Data Quality Objectives (Table 28) for the field measurements of chemical properties, specific conductance, and physical properties should be referenced as level II.
IT

Response: Agree with intent. Analytical levels apply to chemical analyses only. Field pH measurements should be Level II if for final analysis; Level I if for indication.

250. WP-162, Sec 5.3.5.2, P. 2, Sent 3: The Data Quality Objectives need to be defined for analysis of spring sediments, currently not shown by Table 28.
IT

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Response: Disagree. Spring analyses are listed in Table 28 and DQOs for analyses are in Section 3.0 of the QAPP.

251. WP-162, Sect 5.3.5.6, P. 2, last sent: Use of data obtained by mapping of soil types should be defined and related to other tasks in this section.
IT

Response: This sentence will be modified. The intent was to correlate spring location with stratigraphic controls if possible.

252. WP-162, Sec. 5.3.5.2, Para. 4: If springs are active during high water, they should be sampled at high water.
IT

Response: Springs are not generally active during periods of high river flows. Short term decreases in river flow do occasionally expose seepage areas, however, past sampling activities indicate that the contaminant concentrations during these times are influenced (diluted) by river water and are not indicative of worst case conditions.

253. WP-163, P. 4: State what the results of Phase I sampling would have to be to "warrant" the expansion of Phase I sampling to further define the extent of influence from the discharge of the riverbank spring.
IT

Response: Agree. Text will be modified.

254. WP-163: How important is it to have four samples from vicinity of springs. What about underwater discharge? Why aren't samples collected from the springs adequate or superior?
NUS

Response: Four samples is the minimum number of samples needed to perform an initial assessment of the extent of the affected area due to the inflow of contaminated ground water. Underwater discharges are being addressed in the Phase II near-shore sampling along the ground-water plume as defined by the ground-water monitoring data. Spring samples are used for identifying contaminants of concern entering the river however they don't tell us anything about the levels or extent of contaminants within the river, which is what the near-shore samples are intended to do.

255. WP-165: "Relatively standard water quality evaluation techniques" is very imprecise. Please state or reference the techniques to be used.
NUS

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Response: Agree. The text will be changed accordingly.

256. WP-165, Sec. 5.3.5.3, P. 3: See FF-1 EPA comment 158 concerning the method of sediment sample collection. This effort deserves more detail than is provided here.
IT

Response: Agree. Text will be expanded/clarified.

257. WP-165, Sec. 5.3.5.4: Task 5d appears to be more politically motivated than scientifically reasoned. The probability of seeing any differences in water chemistry is extremely remote. Please provide the rationale for why the task should not be eliminated.
IT

Response: It is agreed that the probability of detecting an impact on the overall water quality of the Columbia River attributable to the 300-FF-5 operable unit is remote. However, the potential for undetected and unmonitored subsurface seepage of contaminated ground water from the operable unit into the Columbia River mandates that transect sampling be done to confirm this "no impact". In addition, such transect sampling allows for a comparison of Columbia River water downstream of the operable unit with applicable ARARs to support appropriate remedial actions.

258. WP-166, Sec. 5.3.5.4, Top P.: Please define the word "significant." If the term is statistical, then the method for determining significance should be presented.

Regarding the content and level of analyses to be performed, see FF-1 EPA comment 159. To assure that meaningful analyses are performed, setting a criterion such as: All contaminants of concern showing positive detection in either groundwater or seep analyses will have analytical tests for them run on surface water samples. It may be wise to consider FF-1 EPA comment 162 concerning sampling within one meter of the bottom.
IT

Response: Agree. Text modified with respect to "significant." The depths of 20%, 60% and 80% were selected to provide evidence of a vertical concentration profile, should it exist, and coincide with velocity measurements typically taken at 20% and 80% of the depth, in order to accurately compute the average velocity and discharge (water and contaminant) of each river sector. Depths nearer the bottom during this activity may bias this average contaminant discharge and be unrealistic of average river conditions. It is intended that the

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transect locations be established far enough downstream of the operable unit to assure vertical mixing and avoid the "localized" influence which should be observed and defined during Phase II near-shore sampling activities. Sample collection during Phase II is identified as "as near the bottom as possible without disturbing the bottom sediment", typically within 1 to 2 feet.

259. WP-166, Sec. 5.3.5.4, Para. 2: River water samples need to be collected nearer the river bottom than the 80% depth. The 80% depth could be about five feet which is enough to dilute contamination entering from the unconfined unit.
IT

Response: See response to comment 258.

260. WP-166, Sec. 5.3.5.5, P. 4: Concerning the correlation of surface water records at the 300 Area with the USGS Gage below Priest Rapids Dam. Please provide the method(s) by which this correlation will be made. There are Travel Time factors and river geometry to consider as well as major withdrawals and returns of flow to the river in this reach, in addition to the backwater effects caused by Lake Wallula.
IT

Response: Sentence referring to "correlation" deleted. It is agreed that many factors, in addition to the flows at Priest Rapids Dam, influence the river stage along the operable unit which must be considered.

261. WP-167: What is the purpose of the measurement of contaminant concentrations in springs and the comparison to adjacent river water to estimate dilution. Is this qualitative or to be used for modeling? Please explain, as it seems only marginally useful. What is "the simple dilution algorithm"?
NUS

Response: The test will be modified to indicate that this is "a" simple dilution technique and not referring to a specifically named technique. If we know the concentration of the spring water and the adjacent river water into which the spring water has discharged, the difference is an indication of the amount of dilution taking place as the groundwater (spring water) enters the river. This work will be supported by dye studied in the river to further evaluate dilution.

262. WP-167: Is surface water transport to be modeled? Are contaminant plumes in surface water to be constructed? If not, why not?

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NUS

Response: If extensive modeling itself is necessary, as determined through application of ARARs, then these items will fall out of it. Text modified to include transport modeling. Contaminant plumes will be constructed if encountered. We do not expect to encounter any mappable contaminant plumes in the Columbia River.

263. WP-168, Sec 5.3.5.7, P. 2, Sent 2 & 3: It is doubtful that a "complete" understanding will ever be attained of the geology, water levels, aquifer properties, and other parameters required to support the modeling effort in the paragraph.
IT

Response: Agree. Complete will be changed to detailed. It is agreed "complete" understanding is optimistic, however, a better understanding is required to begin to model this complex phenomena.

264. WP-168. Sec 5.3.7: Background samples for biota sampling media are not addressed nor the Field Sampling Plan (Attachment 1). These samples should be included.
NUS

Response: Disagree, but text will be added to Section 5.3.7.1.1 of the WP and 3.1 of the FSP to clarify sampling for contamination.

265. WP-169, Sec 5.3.7.1.1, P. 1, Sent 10: "Rock benthos" should be "soft bottom benthos."
IT

Response: Accept. Text will be changed - "Rock" deleted.

266. WP-169: Have any studies been conducted for non-radionuclide constituent accumulation in periphyton? If so, they should be addressed.
NUS

Response: No studies of nonradiological contaminant accumulation have been done for Hanford biota.

267. WP-169: Dredging by boats for benthos samples disturbs a large area and encourages contaminants to migrate downstream. In addition, it would be difficult to identify an "exact" sampling point. A ponar sampler may prove to be a more successful sampling tool.
NUS

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Response: Agree. "Dredging" was clarified by specifying an Ekman or Ponar grab-sampler.

268. WP-170: The process used to select the biota to be sampled should be addressed in far greater detail (as part of the Data Quality Objectives process). For example, why are rock benthos to be sampled, but not sediment benthos, which may prove more indicative? Likewise, why shiners rather than a bottom dweller.
NUS

Response: Agree. Text will be added to the Work Plan to further describe the rationale for selecting species.

269. WP-170: Gill nets and electro-fishing are methods of rather indiscriminant sampling. Other methods, perhaps beach seines, would provide more species-specific information.
NUS

Response: Agree. Text will be modified to allow for use of alternative methods.

270. WP-170: Should explain how the transects planned for the river coincide with the seeps and springs.
NUS

Response: Agree. Text will be modified accordingly.

271. WP-171 & WP-174, Figures 35 & 36: The flow direction of the river, and the locations of the seeps and springs, the background sample (if possible), and the waste trenches should be indicated.
NUS

Response: Agree. Locations of known seeps and springs are roughly located as shown in Figure 14; others will be identified in this task. Background sample location will be determined from lowest assay value of transects. Map will be changed to indicate Johnson Island, operable unit boundaries for 300-FF-1, and river flow direction.

272. WP-171, Figure 35 and WP-174, Figure 36: These figures should be made consistent with the others as far as scale and the naming of features.
IT

Response: Partially accept. Operable unit names and island names will be revised to be consistent with other figures. Scale is retained as it is appropriate for the figure.

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273. WP-172, Sec. 5.3.7.1, Items 1 & 2: It is unclear whether the two tasks use the same ten rocks or if there are a total of 20 rocks collected. Suggest clarification in the lead-in text.
IT

Response: Agree. Text will be included in the Work Plan and figures will be added to the FSP to clarify this discussion.

274. WP-173: If the stem and leaves of the riparian plant samples are air dried, would the concentration of the tritium, metals, or organics, if present, decrease? Why are only a limited suite of constituents being analyzed for in the riparian plant samples? Biota should be analyzed for organics, metals, and pesticides/PCBs to fully characterize the extent of environmental contamination from the site (e.g., page WP-173).
NUS

Response: Concentrations of radionuclides and trace metals are often expressed as pCi/g dry weight or μg/g dry weight. Fresh weights may be made to determine water content at time of harvest; however, water content varies with kind of tissue, time of day, and season of the year. Nonvolatile radionuclides and metals are expected to remain in the plant tissues in the drying process.

Tritium is tritiated water and can be collected by extracting water from the freshly cut tissues (leaves and stems). Results are expressed as pCi/liter of extracted water. Tritium will not be addressed in this FSP because it has not been detected in this area.

If enhanced concentrations of organic contaminants occur in the tissues of herbivorous animals (rabbits and voles), plants would be sampled and chemically analyzed to help locate the contaminant source(s) for remedial action.

275. WP-173: Voles and rabbits are recommended to be sampled; likewise, asparagus is to be mapped. These do not appear to be addressed in the Field Sampling Plan.
NUS

Response: Agree. Asparagus sampling will be included in the revised field sampling plan (see SAP/FSP-27).

276. WP-173, P. 2, beginning with "In these cases,...": This section is irrelevant, as the regulatory community has not recognized biological sampling as a means of determining the presence or absence of contaminants in the groundwater flow system.

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IT

Response: Agree. It is not the intent of plant sampling to replace conventional groundwater monitoring methodology. It is only intended as an adjunct to groundwater monitoring, especially in those places where groundwater is closed enough to the surface to be contacted by plant roots.

277. WP-174, Figure 36: Sample stations should coincide with the other media to be sampled to correlate data.
NUS

Response: Spring vegetation samples will be coincident with other media samples. However, riparian and aquatic biota samples address different parts of the ecosystem and are not expected to show spatial correlation except at springs.

278. WP-175: Sample analysis and validation should be addressed as a separate task in the Work Plan, probably best after the biota investigation (Section 5.3.7) and before Data Evaluation (Section 5.3.8). Sample analysis and validation should also be addressed in much greater detail in both the Field Sampling Plan and the Quality Assurance Project Plan.
NUS

Response: Disagree. Sample analyses and validation are part of each task in which analyses are planned.

279. WP-175: Reference is made to manmade organic contaminants which will be analyzed for in tissues. The contaminants, and the analytical procedures to be used, should be specified.
NUS

Response: Agree. Contaminants are those listed as contaminants of concern (Table 24). Text was added to indicate analytical methods.

280. WP-175: It is stated that "gut and contents will be discarded." However, the liver, spleen, and kidneys are important organs for analyses.

Response: Agree. "Gut" refers to the stomach, intestine, colon, and associated mesenteries. Liver and kidneys will not be removed.

281. WP-175: The sample archiving method should be reconsidered. Freezing will decrease the concentration of contaminants. For example, tritium will "leak" to the freezer through time and become incorporated in the ice crystals.

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NUS

Response: Disagree. Samples will not be analyzed for tritium because it has not been detected in this area. Samples will be stored in containers to prevent cross-contamination and changes in concentration over time. Freezing is specified by the U.S. EPA for storage of animal tissue samples (EPA-540/01).

282. WP-175: The data evaluation section is very weak in its description of the graphical and statistical methods that will be used to help evaluate the data. The description of the "evaluation" of the soils is weak.
NUS

Response: Non-specific comment. Opinion noted.

283. WP-176: Sorption and desorption studies of soil should be designed to provide information that is specific to the chemicals of concern.
NUS

Response: Agree. The statement will be revised to indicate that these studies will be conducted for those contaminants found above ARARs or could contribute to the overall risk of the site.

284. WP-177: Please clarify the statement "is the vertical extent of contamination in the unconfined aquifer and underlying confined aquifer interconnected with the confined aquifer".
NUS

Response: Agree. This sentence will be changed to: "What is the vertical extent of contamination in the unconfined aquifer and is the upper confined aquifer contaminated?"

285. WP-177, Sec. 5.3.8.3, P. 2, last Sent.: What does this mean? Please rewrite to clarify exactly what is meant.

Response: Agree. See response to comment 284.

There is no discussion of numerical modeling as was first mentioned in Sec. 4.2.1.1, Task 8. Please define the models anticipated to be used and the data requirements of these codes. These data are necessary to assure that the proper information is being gathered during the field program. In fact, all items in Task 8 should be addressed.
IT

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Response: Agree. A section that describes the use of CFEST for parameter estimation and VTT (or some other simple model) to help establish well spacings and pumping rates to be used in aquifer tests will be added at this point.

286. WP-181 & WP-182: A risk level of 10^{-4} is questionable. Note that ARARs in Table 23 (page WP-111) use 10^{-6}; note also comment on top of page WP-110.
NUS

Response: Accept. Change risk level in first sentence of the last paragraph on p. WP-181 from 10^{-4} to 10^{-8} to be consistent with Table 23 on p. WP-111. However, as indicated on p. WP-182, EPA uses a range of lifetime risk of contracting cancer (for exposure to carcinogens) of between 10^{-7} to 10^{-4}.

287. WP-182: The text states that the risk evaluation of the remedial alternatives "is beyond the scope of the current effort". What is the "current effort"? Should clarify that the risk evaluation will be included in the RI/FS work plan as part of a detailed analysis of alternatives (i.e., part of the Feasibility Study).
NUS

Response: Accept. The statement "...beyond the scope of the current effort" is referring to the baseline risk assessment. The risks associated with the various remedial alternatives which are identified will be evaluated as part of the Feasibility Study. The last sentence in Section 5.3.9.4 should be modified to read "...but this risk evaluation is beyond the scope of the baseline risk assessment."

288. WP-183: The estimated frequency (annually?) at which the three reports will be issued should be discussed.

Response: Agree. The reports will be issued at the end of each investigative phase or annually, whichever comes first. The text will be modified accordingly.

289. WP-186: Should clarify how Phase II, discussed regarding wells (e.g., page WP-147), is related to Phase II of Remedial Investigation.
NUS

Response: There is no relationship between the use of the term "phase" as it applies to Section 5.6 and Section 4.3.4 (including page WP-147). The title to Section 5.6 has been revised to omit "Phase II" in order to avoid confusion.

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290. WP-192: What is the significance of "changes in the volume or nature of contaminated media identified through additional site characterization" and how important is it to the definition of remedial alternatives? Is this just an update of the extent of contamination?
NUS

Response: This comment questions the significance of "changes in the volume or nature of contaminated media identified through additional site characterization" on the definition of remedial alternatives. The applicability, implementability, and cost of a remedial alternative can be sensitive to specific changes in total volume of contaminated medium, the degree of contamination, and the presence or absence of inhibiting characteristics. The economies of scale will be different for different process options. In some instances, minimum or maximum capacity of available equipment could affect implementability. Further characterization could result in the addition, elimination, or change in concentration of a contaminant that could affect applicability of a candidate technology. Similarly, the presence of certain characteristics of the medium, such as certain dissolved solids or organics, can affect the suitability of certain processes or result in the addition of pretreatment steps.

291. WP-194, General: The number and variety of phases discussed in the description of work to be performed is confusing at best. This discussion of schedule needs to provide a cross-walk to show where these phases and subphases fit into the overall schedule for accomplishing the assigned tasks.
IT

Response: The schedule for the 300-FF-5 operable unit (Figure 39) has been kept general in order to provide maximum freedom to execute the work. Only critical sequencing is indicated on the figure. For instance, drilling must be conducted before aquifer tests or water samples can be collected.

292. WP-194, Section 6.0: The schedule does not address when specific and detailed work plans for each investigation will be written (see page SAP-1). The schedule needs to allow for the time necessary for regulatory review.
IT

Response: Agree. The schedule allows for review time. The detailed work plans (includes work procedures) that can be executed in the field will be prepared during the first nine months of FY90, while the Work Plan is being reviewed and completed. It precedes the beginning of the schedule.

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293. WP-196, Figure 39: Relating this schedule to the proposed work is difficult if not impossible. The figure (or a figure) needs to present the detail of the proposed tasking.
IT

Response: Disagree. Major tasks are scheduled. The level of detail is considered adequate at this stage of planning.

294. WP-198: This section does not include the reference to DOE-RL, 1983, Quality Assurance, DOE Order 5700.1A, U.S. Department of Energy, Richland Operations Office, Richland, Washington; however, it would appear that this is a relevant document. Recommend that the above reference be included, and the use of the NQA-1 document be invoked.
HAZWRAP

Response: Disagree. See response to comment 16. Also, NQA-1 has been used as indicated by the 18 chapters of the QAPP (this differs from 14 chapters required by EPA guidance).

295. WP-201, EPA, 1988a: Please provide the issue date for this document and the EPA document number. Is it March 1988, August 1988 or October 1988? Assorted revisions of this titled document were issued during 1988.
IT

Response: The version used was the "Interim Final." There is no monthly issue date--it is final.

296. WP-201: Please provide document numbers on all EPA references. They are difficult to order without this number.
IT

Response: Accept. Numbers will be added.

297. SAP/FSP, GENERAL: In "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (EPA, 1988) page 2.16, section 2.3.2.1 it is stated "The FSP should be written so that a field sampling team unfamiliar with the site would be able to gather the samples and field information required". This FSP does not provide the detail necessary to satisfy the above direction. Revise the FSP to meet the intent and requirements of EPA (1988).
IT

Response: Disagree. The FSP is consistent with directions taken in other work plans, such as for 300-FF-1 and 100-HR-3.

Commentor Codes: IT = International Technology, RL = Richland Operations, HAZWRAP = DOE/HQ-DP contractor, NUS = DOE/HQ-E&H contractor, OCC = Office of Chief Council - RL,

298. SAP/FSP, GENERAL: Much of the detailed sampling information is provided in the Work Plan. However, a work plan usually describes why the work is being performed and briefly how it will be accomplished. The Field Sampling Plan should describe in detail how the work will be performed so that field personnel will be able to perform their part of the RI/FS from it. Although there is more detail in the hydrogeology section (with respect to well placement, depth, and material), other areas of the Field Sampling Plan are significantly lacking. In addition, it is very important that the Work Plan and the Field Sampling Plan agree on what is to be sampled (the biota sampling sections are especially weak.)
NUS

Response: The level of detail provided in the 300-FF-5 Work Plan is consistent with other work plans, such as 100-HR-3. The FSP has been written to the level of detail required to allow the group that will implement the Work Plan to prepare detailed implementation specifications. This cannot be done at this time.

299. SAP/FSP, General: As with past field sampling plans, there is a general lack of specific procedures which will be followed to conduct the proposed work. Reference is made to the QAPP, which in turn does not contain the required procedures in the text or in appendices. There are several notable improvements however, one being the use of tables to provide information on what the data will be used for and listing special sampling requirements. The rationale for the sampling and monitoring is better documented (in the work plan) than most past work plans.
IT

Response: The problem with referencing procedures is that many are not written and/or cleared for public release and, therefore, cannot be referenced. To remedy this situation, a section that presents the procedures needed for the work will be added to the QAPP.

300. SAP/FSP-1, Sec. 1.1.1, Para. 1: Include a reference to Table 28 which lists the Data Quality Objectives.
IT

Response: Agree. Text modified.

301. SAP/FSP-1, Sec. 1.1.2, Para. 1: Reference sections of the work plan which present the rationale for the location of the proposed sample locations. Reference should also be made to Tables 30 and 31 of the work plan for sampling frequencies. Specific comments on the location of the proposed new monitoring and test wells, frequency of data collection and sampling are also provided in the Section 5 comments.

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IT

Response: Agree. The following will be added to the end of this paragraph: "The rationale for the location of proposed sample locations and frequencies are presented in sections 5.3.2, 5.3.3, and 5.3.4 in the work plan. Sampling frequencies for geologic samples are presented in Tables 30 and 31."

302. SAP/FSP-1, Sec 1.1.3: No sample designation scheme is presented for samples other than for soil. Provide a sample identification scheme for all geological and hydrological samples.
IT

Response: Disagree. Section 1.1 includes soil sampling only. See Section 1.2.3 for groundwater samples, Section 2.3 for surface water and sediment, and Section 3.1.3 for biota. Admittedly, the details of sample identification are not presented because this issue has not been resolved at Hanford.

303. SAP/FSP-1, Sec 1.1.4, P. 1, Sent 1: References are common in the Field Sampling Plan to procedures and to the QAPP for control of drilling, sampling, field screening, and installation. However the QAPP only states that procedures shall be developed. The QAPP should provide a listing of procedures that are approved and in-place, and those procedures needed to control the activities.
IT

Response: Agree with intent. A matrix of procedures will be added to Section 4.0 of the QAPP. See response to comment 299.

304. SAP/FSP-1, Sec. 1.1.4, Para. 1: The proposed procedures are not contained in the QAPP or Appendices. Reference should be made to the sample collection and field and analytical procedures proposed in Tables 30 and 31 of the work plan. The authors should be commended for using these tables to identify data uses and special requirements and limitations. Specific comments regarding the proposed sampling procedures listed in these tables are given in the Section 5 comments. General comments regarding the procedures: proposed sampling methods need to be specific for each strata when more than one method is listed, and the approved EII procedure number should be identified. For example, in Table 31, there are four different sample collection methods listed for obtaining samples for organic carbon content. Some of these methods are only appropriate for consolidated materials, not sand and gravel. Each method should then have an EII procedure number referenced.
IT

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Response: Agree. See response to comment 303. In addition to Table 1, a summary description outlining the proposed drilling, sampling field screening procedures, and installation procedures will be added to the text after paragraph 1 as follows:

"Drilling to obtain high quality geologic samples for characterizing the geologic and hydrologic characteristic of sediment and rock will consist of 12 boreholes. These 12 boreholes will be drilled by air rotary (e.g., Becker) method or an approved equal through the Hanford formation. Sampling will consist of cuttings collected at the surface. The samples will be disturbed, but the basic geologic character of the sediments will be identifiable. After penetrating the Hanford formation, temporary, threaded or welded 4 in. diameter casing will be set inside the 6 in. diameter I.D. air rotary drill pipe. A thick bentonite slurry will be tremied into the annulus between the inside of the drill pipe and the 4 in. casing in 10 ft lifts as the drill pipe is progressively pulled out of the borehole. The bentonite slurry will serve as a seal to minimize fluid losses during subsequent mud rotary drilling, and facilitate easy removal of the 4 in. casing after drilling and sampling are completed. After all of the drill pipe has been removed, and the annular space sealed, drilling using mud rotary with continuous wireline core sampling will continue through the fine-to-coarse grained Ringold Formation to the top of the M3 layer, but will not penetrate it. Wireline core sampling is proposed to obtain undisturbed samples for laboratory analysis (See section 5.3.2.3 of the work plan). Once the M3 layer is encountered, coring will cease. The core sampling assembly will be removed and a high solids (at least 20 %) bentonite grout will be pumped into the drill as it is pulled out. This will seal the borehole up to the bottom of the 4 inch casing. The remaining wireline drill rod will be removed, and a tremie pipe will be set into the well near the bottom of the 4 inch casing. Then as the 4 inch casing is removed more high solids bentonite grout will be pumped through the tremie pipe to fill the void inside the 4 in. casing. At the surface a small diameter, 2 foot deep, concrete marker will be placed at ground surface with a brass monument marker set into the concrete. These 12 boreholes for geologic characterization will each be located approximately 25 ft down gradient of each of 12 new ground water nested monitoring well locations.

Each of the nested well locations in conjunction with the nearby characterization boreholes will serve as a reference source for geology, water chemistry, and hydrology in the 300-FF-5 operable unit. The nested wells will be logged, instrumented and sampled.

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These 12 nested well boreholes will be completed with three 2 in. diameter I.D. monitoring wells in each borehole. Installation of these monitoring wells and sampling of these boreholes will be accomplished in the following manner. The wells will be drilled by air rotary (e.g., Becker) method with continuously driven temporary casing or an approved equal through the coarse sediments of the Hanford and Ringold Formations to the top of the M3 layer. Sampling will consist of cuttings collected at the surface. The samples will be disturbed, but the basic geologic character of the sediments will be identifiable and correlatable with the nearby characterization boreholes. After penetrating to the top of the M3 layer, the temporary casing will be driven at least 5 feet into the M3 layer. If the M3 layer is not present and basalt is encountered instead, then drilling must cease and only two 2 in. diameter monitoring wells will be constructed in the borehole.

If the M3 layer is present, the air rotary drill rod and bit will be withdrawn from the borehole and most of the water shall be pumped from inside the 12 in. casing. The purpose of this is to prevent contamination of the confined aquifer and determine if an adequate seal had been achieved by drilling into the M3 layer. If an adequate seal has been achieved, water level in the well should rise at less than a few inches in an hour. If no leakage is apparent, then drilling can proceed; if not, then a bentonite slurry (about 5 gallons) must be tremied into the borehole and the casing driven 2 to 3 additional feet into the M3 layer, then tested again. Within the 12 to 14 in. diameter casing still in the borehole, an 8 inch casing will be set and drilling will continue through the M3 layer using the cable tool method. Sampling of the M3 layer will be accomplished by either continuous core barrel drilling or split-barrel sampler. The 8 in. casing will be driven to the top of the basalt. Drilling will continue approximately 10 feet into the upper basalt flow. Basalt cuttings will be analyzed by XRF techniques to determine if the Goose Island or Martindale flow is encountered. If the Goose Island flow is encountered first and the water level in the well is not substantially higher than the unconfined aquifer, drilling will continue into the basalt until the permeable flow top of the Martindale flow is encountered.

After drilling to the desired interval in the Martindale flow, a 6 to 12 in. layer of filter pack will be placed in the bottom of the borehole to form the granular envelope around the well screen. Next, a 10 ft section of 2 in. I.D., 304 or 316 stainless steel well screen or channel pack will be set in the borehole and backfilled with the appropriate size filter pack to at least 2 ft above the top of the screen (See Table 1 footnotes). The 2 in. casing above the screen must be capped at the surface during all completion operations to present

filter pack and other materials from entering the inside of the 2 inch casings. A 1-ft thick layer of secondary filter material that is finer grained than the filter pack will be placed on top of the primary filter pack. This fine sand, if set opposite the overlying M3 layer, will form an effective barrier to the migration of bentonite slurries into the filter pack. After placing the secondary filter, a 6 to 12 in. layer of bentonite pellets will be tremied to the top of the secondary filter as the 8 inch casing is pulled back. The pellets should be allowed to swell for at least two hours. Next, a slurry consisting of a high solids (at least 20 %) bentonite or cement grout will be pumped through the tremie into the borehole as the 8 in. casing is completely pulled out. The borehole should be filled to within 2 to 5 feet of the top of the M3 layer. After the bentonite layer has set about 12 to 24 hours, the annulus should be bailed or pumped down approximately 20 ft, and measurements will be taken every hour for a period of 24 hours to determine if water levels are rising or declining. If water levels are rising significantly then adequate hydraulic isolation has not been achieved. If water levels are remaining static then hydraulic isolation should be satisfactory. If water level conditions appear satisfactory bentonite pellets should be tremied to fill the remaining borehole to the top of the M3 layer as the 12 or 14 in. casing is pulled back to the top of the M3 layer.

Next, the second 10 foot stainless steel monitoring well screen and casing riser is set without a sediment trap or a sand base. By maintaining the bottom of the well screen equal to the top of the M3 layer will allow for more effective detection of DNAPLs in aqueous or non-aqueous phase. Filter pack, secondary filter, bentonite pellets and bentonite grout (cement grout should not be used in the saturated zone of the unconfined aquifer are placed in the same manner as for the deepest monitoring well in this borehole nest. Bentonite pellets should extend to within 15 feet of the highest annual water level so that the top of the third screen is never below water. This will ensure that floating NAPLs can be detected. The only exception to this is if a 1-ft thick or greater layer of silt is encountered, then the bottom of the well screen may be set as little as 5 feet into the saturated zone with the bottom of the well screen equal to the top of the silt and clay layer. As the last 21 feet of 12 in. casing is removed, a cement grout slurry should be used to seal the annulus. At the surface, a 4 ft by 4 ft concrete pad 6 inches thick will be poured. A brass monument marker and a protective stainless steel or anodized aluminum housing will be set into the concrete. Protective steel posts will be installed around each well.

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305. SAP/FSP-2, Sec 1.1.2, figure 1: No proposed locations are provided for the six large-diameter pumping wells. Provide the proposed locations.
IT

Response: Agree. Test well locations will be added to Figure 1.

306. SAP/FSP-2, Figure 1 : The legend for well 399-13A should indicate that it is for differentiating between uranium contamination sources, not for defining the extent of the uranium contamination. Also it is difficult to evaluate well locations relative to potential source areas for the FF-1, FF-2 and FF-3 areas because; (1) the source areas for FF-1 are not presented on any figures and (2) the coordinate system on work plan Figures 4 and 5 are different from SAP/FSP Figure 1 (although FF-2 is relatively easy to identify units). Figure 1 in the SAP/FSP should show pertinent facilities in the FF-3 area.
IT

Response: Disagree. The wording will be changed in the explanation in Figure 1. Because there are many potential sources of contamination, only the primary sources are shown on this figure.

307. SAP/FSP-3 to 6, Sec 1.1.2, Table 1: The Work Plan describes the twelve monitoring well sites to be drilled using continuous core techniques. However, this table lists the proposed drilling techniques as Becker or CSR. Correct the table to agree with work plan text.

Response: Agree. Table 1 will be corrected to reflect the actual drilling techniques for all layers to be drilled.

308. SAP/FSP-3, Table 1 and Figure 2: The use of six large diameter (12-inch) test wells should be evaluated in light of the current difficulties with contaminated water disposal. Large volume pump tests may not be practical at this time, and sufficiently accurate information can likely be obtained using some of the other test methods proposed by the authors (Sec. 1.3.2). If these wells are used they should be identified in Table 1 and shown on Figure 1.

Response: Agree. The six large diameter test wells will not be tested if contamination is above drinking water standards.

Although the screened interval is described, specific reference as to whether the screens for the monitoring wells and piezometers (not the test wells) will be set to be able to detect floating NAPL, or whether the top of the screens will be below the groundwater interface, should be made.

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Response: Agree. Wells screened in the top of the unconfined aquifer will be designed to detect floating NAPLs year round. See response to comment 304 for details.

Wells which will be completed in the lower portion of the unconfined aquifer should have bottom sumps (2 to 4 ft. long) to permit detection of dense NAPL (DNAPL). The sumps should be sealed into the M-3 unit with bentonite.

Response: Disagree. Placement of wells should be under tension, which requires suspending the well casing string slightly above the bottom of the borehole. A minimum of 1 ft will ensure a continuous granular envelope around the well screen. If detection of Dense Non-aqueous Phase Liquids (DNAPL) moving along the bottom of the unconfined aquifer is desired, the sand should extend only to the bottom of the well screen. Also, the screen should be set on a firm base of in situ, low permeability layer of bentonite pellets. A sediment trap, bottom sump, or well foot (a piece of blank casing below the well screen) should not be used on a monitoring well because the amount of sediment fill in a properly designed, developed and maintained monitoring well is minimal. Also, the trap is difficult to purge, particularly for DNAPL, thus samples may not be representative of current conditions in the aquifer (Yu 1989).

The cement grout used to seal the M3 confining layer should be tremied in place.

Response: Agree. The cement or bentonite grout will be tremied into place. See response to comment 304.

Surface seals should extend down to approximately five feet below ground surface and should be at least 1 foot in diameter larger that the borehole diameter. This seal should be a high strength concrete seal, not portland cement. Steel protective casings and locking covers (even in "secure" areas) should be provided.

Response: Agree. Surface seals will be installed in accordance with the response to comment 304. Stainless steel or anodized aluminum protective covers and locks will be provided.

Wells completed in the upper portion of the unconfined aquifer should terminate at the M1 confining layer, where present. Careful attention should be paid to field observations and well construction practices where this unit is present, since DNAPL may be present at the interface.

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Response: Agree. However, this will probably be a fairly unusual occurrence. See response to comment 304.

Monitoring wells penetrating the M3 unit must be constructed by first installing and grouting a protective casing through the unconfined aquifer and 5 to 10 feet into the M3 unit. The grout should be allowed to set for a minimum of 24 hours before proceeding with drilling. Any residual fluids should also be removed from the casing before drilling continues. Nested piezometers which have one piezometer penetrating the M3 unit must be drilled in a similar fashion, with the exception that the protective casing will consist of temporary drive casing with a shoe set approximately 5 feet into the M3 unit. Water should be removed from the casing and the effectiveness of the seat evaluated. If the seal is good, drilling for the deep piezometer can proceed. Once the confined aquifer piezometer is installed and sand packed, grout should be placed to the bottom of the temporary protective casing and allowed to set for 24 hours. Placement of the remaining piezometers can then continue with the drive casing being pulled as installation proceeds.

Response: Disagree and agree. Past experience in the 300 Area RCRA program has shown that driving the temporary steel casing into the M3 clay layer provides an adequate seal for up to several weeks. See the response to comment 304 for details. If grout is allowed to set inside the temporary casing for 24 hours, it will not be possible to pull the temporary casing out. The temporary 8 in. casing will be pulled back as the cement grout is placed.

The drilling technique listed for wells in the top of the unconfined aquifer (sheet 1) specify that casing will be driven into the M3 unit. This is not necessary for these wells.

Response: Agree. Casing does not need to be driven into the M3 layer for unconfined aquifer wells unless they are nested wells that include a well screened in the confined aquifer.

The Becker drill can have significant difficulties with cobbles and boulders. This technique should be reevaluated with respect to the lithology and, since it forces a significant amount of air into the formation, it should be reevaluated for those locations where aquifer sediment samples for volatile organic analyses are required. This latter issue also applies to any air rotary technique.
IT

Response: Disagree. Almost any drilling technique can have significant drilling techniques with boulders. The air concern is not founded,

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because volatiles will be lost from almost any form of drilling that does not collect cores. Also, it is unlikely that significant amounts of volatiles would remain on cobble and boulder sized particles.

309. SAP/FSP-6, Table 1: The text of the Field Sampling Plan, not a footnote of a table should explain how the different wells are to be drilled.
NUS

Response: Agree. See response to comment 304.

310. SAP/FSP-3 to 6 Table 1: The text of the plan should explain the choice of construction material (i.e., SS vs FRE vs PVC); and when the type to be used is not specified, indicate what will determine the choice. Also, should explain why screen lengths differ between 10 and 15 feet, and slot size between #20 and #10. Should also identify the wells in Table 1 to be used as test wells or multiport systems (per figure on page WP-145).
NUS

Response: Disagree. The choice of materials will be based primarily on cost and supply. Only two materials are being considered as shown in the revised version of Table 1. All monitoring wells will be constructed with stainless steel well screens or channel pack screens, and have either fiberglass reinforced epoxy casing or stainless steel casing. See response to comment 209.

311. SAP/FSP-6, Sec 1.1.2, Table 1: The "NOTE:" on the table cites six test wells. These should be included in the table, not just in the note.
IT

Response: Agree. They will be added.

312. SAP/FSP-6: The proposed use of FRE casing and screen is a new process at Hanford. Even though it may be an excellent alternative, have the necessary engineering studies been conducted (such as Kaspar and Myers, 1986) so that the Functional Design Criteria standards are met? The change to 2-inch diameter casing is another major change and will need to be justified.
IT

Response: Agree. Adequate information is available in published literature to determine the use of the materials proposed. This information presented below should be summarized into an engineering study such as Kaspar and Myers, 1986.

See the response to comment 209 in the Work Plan regarding material selection.

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The advantages and disadvantages of small- versus large-diameter casings have been debated (Rinaldo-Lee 1983; Schalla and Oberlander 1983; Schmidt 1983; Voytek 1983; Schmidt 1982). Important reasons for using large-diameter wells include determining large-scale aquifer characteristics (i.e., transmissivity, storage potential) and boundary conditions of high-yield aquifers. However, when such high-yield conditions do not exist or very large diameter test wells are needed (e.g., 300-FF-5 operable unit), the reasoning has been that small-diameter wells are better (Voytek 1983). Small-diameter wells are less expensive because 1) smaller quantities of materials are installed; 2) drilling costs per foot are lower because borehole diameters are smaller and, therefore, less costly drilling methods can be used; and 3) the quantities of contaminated purge water and drill cuttings for disposal at an approved hazardous waste disposal site are much lower. For example, the purge volume of a 4-in.-diam. well is four times the purge volume for an equivalent 2-in.-diam. well. With new technology such as high volume small diameter pumps, vented surge plungers, and channel packs, small-diameter well screens are more easy to develop than in previous years. For many types of water level measurement devices, particularly data logging equipment, the 2-in.-diam. wells with dedicated sampling pumps can provide sufficient clearance between the well casing and pump chamber or riser.

313. SAP/FSP-6, Table 1: The discussion in the footnote to the Table 1 indicates that the top of the screen will be approximately 5 to 10 feet below the top of the aquifer; yet Figure 2 (page SAP/FSP-8) shows the screen to be flush with, or above, the top of the aquifers. Please rectify.
NUS

Response: Agree. The text in Table 1 will be corrected.

314. SAP/FSP-7, Table 1: Purposes of the wells should be discussed in the main body of the text (Chapter 5). The wells to be used for tracer sampling should also be discussed in main body of the text.
NUS

Response: Disagree with this proposed format change.

315. SAP/FSP-7, Table 1: "All new wells" and "primarily existing wells" should not be part of a footnote for a specific well but should be discussed in text.
NUS

Response: Agree. Table 1 will be corrected.

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316. SAP/FSP-7: What is "CSR" footnote to table.
NUS

Response: Agree. CSR note will be deleted.

317. SAP/FSP-8, Figure 2: According to the specifications on FSP-6, this figure is incorrect. Additional arrows and explanation are needed to define the new wells. Only the shallow well is proposed as stainless steel. The intermediate and deep wells are proposed to be constructed of FRE.

The pumping well does not match the verbal description either. The temporary casing should extend 10-15 feet below the water table.

The figure should show the five single point monitoring wells, drilled for DNPL detection. The figure should also show the design of the nested monitoring wells used for uranium and DNAP monitoring.

All monitoring wells are stated by earlier text to be two inches internal diameter, so the inclusion of design drawings on the figure for six inch diameter stainless steel cased wells is not appropriate.

The 2-in.-dia. well is missing half of the bottom bentonite seal.
IT, NUS

Response: Agree. Corrections will be made to drawings and Figure 2 and Table 1 for consistency.

318. SAP/FSP-9, Sec 1.1.5, P. 1, Sent 2: Requires the use of field logs and well logs per procedures in the QAPP, but the QAPP does not provide detail needed, only provides a general statement that procedures will be developed. Section also refers to the use of other undisclosed sampling techniques. Details of these sampling techniques should be provided.
IT

Response: Disagree. Adequate information on sampling procedures has been provided.

319. SAP/FSP-9, Table 2: The specific constituents and method of analyses (total, extractable, etc.) need to be specified. The generic statement is insufficient.
IT

Response: Accept. The specific constituents and methods of analysis are given in Table 31. A reference will be made to Table 31 in Table 2.

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320. SAP/FSP-9, Sec. 1.1.5, Para. 2: Field screening results for volatile organics will be detrimentally affected by the use of air rotary or air hammer methods.
IT

Response: Accept. The purpose of field screening is to determine if contaminants are present, as well as for health and safety purposes. Field screening yields only qualitative estimates of concentrations of contaminants. Quantitative measurements must be obtained from intact sediment samples obtained from the borehole.

321. SAP/FSP-9, Sec 1.1.5, 2nd para: The list of analyses to be performed does not agree with the list presented in Table 30 of the work plan Section 5.3.2.3, pg. WP-139 to 141. Revise this section to conform with table 30.
IT

Response: Accept. The list in the SAP/FSP will be made consistent with Table 30 for field activities and Table 31 for laboratory activities.

322. SAP/FSP-9, Sec 1.1.5, P. 4, Sent 1: Chain of custody section in the FSP refers to the QAPP, but QAPP provides little detailed instruction or a specific procedure. Chain of custody in the QAPP should be expanded, or cite the specific procedure.
IT

Response: Accept. Section 4.0 of the QAPP will be revised to include a matrix of sampling and investigation procedures. The Chain of Custody procedure is included in this matrix.

323. SAP/FSP-10, Sec 1.2.2, P. 2, Sent 2: Justification for hourly measurement of water wells at 20 well locations and in about 50 wells in and near the 300-FF-5 operable unit should be given.
IT

Response: Disagree. See response to comment 231 of the Work Plan.

324. SAP/FSP-10: Should identify the 20 wells that will have water levels measured hourly. A map of locations would be very helpful.
NUS

Response: Agree. A figure will be added showing water level well locations.

325. SAP/FSP-10, Sec. 1.2.2, Para. 2: A reduced level of effort on continuous and hourly water level monitoring seems warranted. The proposed

schedule, while it would likely yield interesting information will be very expensive. It seems that the groundwater/surface water interactions are largely known, and that perhaps three to five well cluster locations would adequately supplement the existing information. It is suggested that three locations be selected which lie in an east-west line from the river to the western operable unit boundary. Well clusters 399-1-16 (existing), 399-4 (new) and 399-5 (new) would be good choices to evaluate how the magnitude of gradient changes due to the river vary with distance from the river and within each hydrogeologic unit. Additional wells north and south of this line could be added if needed. The data collection equipment described in Section 5.3.4.3 can also be simplified. It doesn't seem necessary to telemetry data back to an office. The data can just be routinely dumped from memory, or charts removed if physical recorders can be used instead of electronic data loggers. The data is not critical enough to need to receive it in "real time".
IT

Response: Disagree. See response to comments 231, 233, and 235.

326. SAP/FSP-11, Sec 1.2.4: Section refers to the QAPP for procedures and sampling equipment to be used, but the QAPP provides only an assurance that such procedures will be developed. Specific procedures and equipment should be provided or listed. This comment applies to many other sections such as 2.3, 2.4, 2.5, 3.1.4 in which the QAPP is cited for procedures, equipment, or methods.
IT

Response: Disagree. Adequate information will be provided with the revisions proposed.

327. SAP/FSP-11, Sec. 1.2.5, Para. 2: This section and Table 4 should specify whether the analyses for metals will be total, dissolved or total recoverable. Also specify whether chromium is to be in the total form or will also be analyzed for the hexavalent form.

Response: Clarification. Analyses for metals will be dissolved (filtered). Chromium will be total form because hexavalent is the primary, if not exclusive, species of chromium in groundwater where pH is neutral or above. Under the pH conditions in the groundwater in the 300 Area, trivalent chromium would probably not be detected because of its low solubility in alkaline aqueous solutions.

Methanol should be added to the list even though it is degraded relatively quickly, since there are several methanol storage tanks, at least one of which is underground, in the operable unit.

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Response: Disagree. Methanol will not be added to the list because it will degrade too fast and would probably not be detected in the groundwater at sensitivity levels for standard analytical methods.

Other than use as a potential indicator of well development quality, and possibly to evaluate influences on the COD test, analysis of Total Suspended Solids for groundwater does not appear necessary. The field method for determining Dissolved Oxygen must be described in detail to determine if the results will be meaningful.

Response: Agree. Other than use as a potential indicator of well development quality, and to evaluate the influences on the COD test, analysis of Total Suspended Solids for groundwater does not appear necessary. However, analysis of Total Suspended Solids will be used to determine if conditions in the well have deteriorated during its useful life and when rehabilitation is necessary.

Agree. The field method for determining DIssolved Oxygen needs to be described in detail to determine if the results will be meaningful, but in a separate methods document manual. Such methods manuals are being developed, but are not available as references at this time.

Consideration should be given to collecting samples for biological and nutrient analyses to evaluate the existing subsurface microbiological conditions and current or potential biodegradation activity.

Response: Agree. Collecting biological samples of groundwater to evaluate the potential biodegradation activity should be addressed in Phase II of the Feasibility Study. If the results of the Feasibility Study indicate that in situ biodegradation is a necessary, appropriate and viable technique; then sampling should be conducted at that time.

It should be noted whether Uranium will be measured in mg/l or pCi/L. It should also generally be noted as to how inorganic parameters are to be reported (e.g. Nitrate as N, or Nitrate as NO3).
IT

Response: Clarification. Uranium and other radioactive isotopes will be measured in pCi/L. Nitrate will be reported as NO_3.

328. SAP/FSP-11, Sec 1.2.5, Table 4: Errors exist in the table for compounds and CAS numbers, see comment for Table 33 in work plan.
IT

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Response: Agree. These will be corrected as they were in the Work Plan.

329. SAP/FSP-11, Sec 1.2.4: Criteria should be cited for the purging of wells prior to sampling. Specific parameters should be listed such as stabilization of pH, temperature, specific conductance, turbidity, or number of well volumes of water purged.
IT

Response: Disagree. Criteria do need to be developed to determine purge water volumes for each well, but that should be done early in the RI not in the Work Plan.

330. SAP/FSP-15, Sec. 1.3.1: The aquifer testing described here and on page WP-156 should conform to each other. Describe how these tests are to be conducted. Not all tests (WP-156) will be pump tests, yet, here it says that only pump tests will be made and then only in large diameter wells adjacent to clusters. The FSP should be a guide to the field operations. So far, it is woefully short of that goal.
IT

Response: Agree in part. The test methods will be delineated, but a detailed description will not be provided because standard procedures exist in several documents that unfortunately cannot be referenced.

331. SAP/FSP-15, Sec. 1.3.1, Para. 1: These wells and tests may be unnecessary and could cause significant water handling problems if the water is contaminated. Suggest deleting these from the program or at least making the decision at a later Phase.
IT

Response: Agree and disagree. The six large diameter test wells will not be tested if contamination is above drinking water standards. The wells should not be deleted from the program if contamination is not a problem.

332. SAP/FSP-15, Sec 1.3.1: Locations of the large diameter test wells should be specified or identified on a figure.
IT

Response: Agree. This comment was already addressed in the response to comment 308. The locations of these wells will be shown in a figure in the SAP.

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333. SPA/FSP-15, Table 4: Should address extra uranium tests (referred to on page WP-151) as well.
NUS

Response: Agree. The uranium isotopic analyses noted in the Work Plan in Tables 30 and 31 will be added here as well.

334. SAP/FSP-16, Sec. 1.3.2, P. 1: One of the chief purposes of tracer tests is the determination of effective porosity, yet it is not mentioned here.
IT

Response: Agree. Would change sentence 2 to read: "The purposes of these tests are to determine flow velocities, effective porosity, hydraulic conductivity, and dispersivity and to provide data....."

335. SAP/FSP-16, Sec. 1.3.2, Para. 1: This type of test could be substituted for the tests proposed in Section 1.3.1. These tests could be done on wells in the western portion by injecting tracer into a well and monitoring a series of nearby wells, and/or by monitoring the decline in tracer concentrations in the injection well. Alternatively, clean water could be injected into a well and water level rises observed in nearby observation wells.
IT

Response: Disagree. This may be possible, but groundwater velocities are believed to be much lower in the western portion of the operable unit; therefore such a tracer test could take several years. Also, the well density will be very sparse in the western half of the site even after installation of all of the phase I wells. The clean water idea is interesting, but proper positioning then becomes critical, and this assumes that the flow direction is well known near the monitoring and observation well.

336. SAP/FSP-16, Sec. 1.3.2, Para. 3&4: It is assumed that the water level monitoring described here is the same described in Section 1.2.2. For this tracer test it would seem that daily manual readings of groundwater levels prior to sampling would be sufficient for the level of accuracy needed for the test evaluation and modeling input. Continuous monitoring of river stage may be warranted. The accuracy of the aquifer transmissivity needed to conduct practical modeling and remedial design activities is not great enough to warrant extraordinary efforts to determine precise values. There will be inherent heterogeneity in the aquifers, uncertainty in each contaminant transport characteristic, and model boundary inaccuracies which will limit the usefulness of a "precise" value. The modeling would be most practical if

values of transmissivity determined from the tracer tests were used and the transport model calibrated to reflect the conditions observed during the test.
IT

Response: Disagree. For meaningful interpretation, the change in the daily water level cycles must be known, particularly for wells within a half mile of the river.

337. SAP/FSP-16, Sec 1.3.2, 1st para: The 2nd sentence suggests that a choice will be made in the future of the actual tracer type. Yet the next sentence makes that decision. Clear up the discrepancy.
IT

Response: Agree. The first sentence on tracer type will be corrected because the type of tracer has already been made.

338. SAP/FSP-16: Should explain how concentrations of tracer will be measured (e.g., what equipment will be used?) QA procedures should be documented in the QA plan. And a description of how the data will be used should be provided.
NUS

Response: Disagree. Adequate information has been provided at this point in time.

339. SAP/FSP-16, Sec. 1.3.2, P. 2: Tracer tests beyond a single time frame are of questionable value. The high frequency of water-level measurements will provide sufficient information to calculate the flow path. A single aquifer test using an array of monitoring wells would serve to define any anisotropy and inhomogeneity of the flow system. The chance of success using tracers is generally so low that other alternative methods should be discussed first. Numerous spills have occurred into the process trenches, perhaps the data derived from monitoring following these releases could be used and reanalyzed at significant savings to DOE.
IT

Response: Disagree. Water levels are valuable in terms of predicting flow direction, but do not provide information on hydraulic conductivity, dispersion, and ground water velocity, which are essential parameters and the primary reason for conducting the tracer tests. If the chance of a successful tracer test is so low as mentioned in the comment, then data from previous spills would not be of any value. Actually, the data from previous spills is the primary reason it is believed that the tracer tests will be successful. If frequent water

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level measurements had been taken during previous spills, the data could be put into perspective and would be useful for modeling and estimating hydraulic conductivity, dispersivity, and groundwater velocity.

340. SAP/FSP-16, Sec. 1.3.2, P. 4: Same comment as earlier about high-tech overkill.
IT

Response: Disagree. The same response as to previous questions on this subject.

341. SAP/FSP-16, Last sent: Should explain what determines whether specific plans for each aquifer test and for the disposal of withdrawn water are necessary.
NUS

Response: Disagree. Adequate information about disposal water has been addressed in the Work Plan.

342. SAP/FSP-17, Sec. 2.2, Para. 1: Reference should be made to the appropriate work plan section discussing the rationale for sample location.
IT

Response: Agree.

343. SAP/FSP-17, Sec 2.2, Sent 1: Should specify that sampling locations are those of surface water and sediment.
NUS

Response: Agree. Text will be modified.

344. SAP/FSP-18, Table 5: Laboratory analytical lists should be evaluated to reduce the cost of this program. The use of indicator parameters is warranted based on the past sampling information. Parameters should be selected based on analytical results of wells near the river, and on which detected compounds pose the greatest threat to aquatic life, or have the greatest potential to accumulate in bottom sediments.

Response: This is an interesting comment in that previous comments have explicitly identified the need to do extensive analytical work. The list of analyses has been evaluated and reduced to contaminants of concern to the extent possible. However, the fact that documentation exists which points out that about anything may have been discharged at one time or another warrants the more extensive list on the initial

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samples. Subsequent sample analysis will be based on previously detected contaminants.

The near shore river - Phase 1 sampling strategy should be tested first at the highest flow spring. If no discernable difference in river concentration at the four locations (Figure 3) is determined, then the rest of this sampling effort should be abandoned.

Response: Testing of the near-shore sampling strategy is a good concept, however, there are some negative implications. The highest flow spring may not be worst case, that is, it may not contain the highest contaminant concentrations or be the largest contaminant discharge point. Therefore we run the risk of not assessing the worst case. If we wait for spring sample analyses to be completed we run the risk of missing the ideal sample period and thus delaying the RI work for another year.

The data collection proposed for the transects may not be very useful. The number of proposed monitoring stations is such that the length of time between measurements at the stations will cast doubt as to any trends which are observed. Without surveyed controlled sections, it will be difficult to repeat any measurements if needed.
IT

Response: Rationale for transect sampling is discussed in the disposition of comment 257. Certainly, in such a dynamic system, replication of exact conditions is impossible, however, performance of similar sampling under similar conditions is feasible to confirm/verify initial findings if necessary.

345. SAP/FSP-18, Table 5: Should include velocity and area measurements for springs, as discussed on page WP-161.
NUS

Response: Agree.

346. SAP/FSP-18, Table 5: It is assumed that "September-October/low river flow" and "Low-flow conditions typically September October" describe the same circumstances; similar language should be used if the same; if different, explain.
NUS

Response: Agree. Table made consistent.

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347. SAP/FSP-18: "Adjacent to 300-FF-5" is too general; if it is to be at SWS-1 and SWS-2, address in the "location" column.
NUS

Response: Agree.

348. SAP/FSP-21, Figure 4: Island identification is inconsistent. On most maps, islands (where identified) are named (e.g., Figure 4, page SAP/FSP-21); on others (e.g., Figures 5 and 6, pages SAP/FSP-28) they are given numbers. Should be consistent, or provide both labels (name and number), cross reference, or discussion in text.
NUS

Response: Agree. Island numbers will be used.

349. SAP/FSP-21, Figure 4. See comments on work plan Figure 23.
IT

Response: There are no comments specific to Figure 23, WP-80. Comments appropriate for Figure 23 will be dispositioned the same as for Figure 4 in the FSP.

350. SAP/FSP-22: Biota to be sampled should correspond to fauna to be sampled per the Work Plan, Section 3.1.6 (page WP-99).
NUS

Response: Agree. Text of FSP was checked against the Work Plan and corrections made.

351. SAP/FSP-22, Sec. 2.4, Para. 1: Detailed sampling procedures are not described in the QAPP or attached documents. Detailed procedures are also not included elsewhere in the work plan. These must be provided.
IT

Response: This must be identified as the first task in performing the field work. That is, procedures must be written and adapted to proper format and WHC approved prior to initiating field work. Text modified to reflect this requirements in this section. This requirement is also provided in the QAPP.

352. SAP/FSP-23: The text discusses providing locational coordinates for any areas where evidence of biological uptake of hazardous substances is found under title of "Sample Designations". It should be made clear that the location of all samples collected will be identified, not just sample where there is evidence of biological uptake.

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NUS

Response: Agree. All locations used as biotic sampling stations will be identified by engineering survey methods (see SAP/FSP-27).

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353. QAPP GENERAL: This section appears to lack level of detail expected by EPA. Since PNL has provided EPA with controlled copies of MA-70, reference to specific sections or procedures might be appropriate. Specific analytical procedures must also be provided based on discussions with EPA.
RL

Response: Disagree. While DOE and others have controlled copies of MA-70, PNL-MA-70 is uncleared and therefore cannot be referenced. The 300-FF-5 work will be carried out in a controlled, safe, and high-quality manner. To do this and to meet Tri-Party Agreement milestones, it is necessary to initially write work plans containing broad strategies for controlling such activities as quality assurance, health and safety, data management, project management, and field sampling. This strategy has been followed in the six Hanford work plans written to date. As stated in the plans, all necessary and sufficient procedures, organizational responsibilities, and controls will be in place before a contractor begins a specific task. Presently, Hanford's DOE contractors are developing broad procedural requirements (as well as specific procedures) to control work activities. Contractors will then either use Hanford's existing procedures or have procedures in place that meet specific requirements. When the requirements and procedures are available, they can be referenced in work plans. In the meantime, work plans are being written to general requirements.

Currently, only the policy section of the MA-70 manual has been cleared for public release. Because the procedures have not been cleared for release, they cannot be referenced in this QAPP. Specific analytical procedures are referenced in Table 3 and are Standard SW-846 Methods.

354. QAPP GENERAL: The continued reference to PNL procedures in the QAPP is not particularly useful since specific procedures are not identified. Also the QAPP author appears to assume that PNL will be conducting the RI/FS, even though the Work Plan was prepared for WHC.
IT

Response: Accept. Specific references to PNL will be deleted. References to WHC will be inserted.

355. QAPP GENERAL: Details should be provided in the Quality Assurance Project Plan. Tables similar to Table 3 (page SAP/QAPP-8) should be added which address other analyses (e.g., CEC). "Applicable requirements", "appropriate requirements and procedures" (page SAP/QAPP-1), "appropriate PNL procedures" (sections 5.1 and 5.2 on page SAP/QAPP-11), logging of wells (per page SAP/FSP-9), the "calibration control system" (pages SAP/QAPP-11 and 17),

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and the frequency and extent of the system audits (page SAP/QAPP-15) should be described in some detail.
NUS

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW for preparation of this plan and the 300-FF-1 format. Several sections of the QAPP (e.g., Section 4, Sampling Procedures) will, however, be expanded. References to specific procedures are not possible since many of the procedures are being, or have yet to be, developed. Section 4 will include a matrix of the types of procedures to be utilized during each of the tasks to be conducted during this work.

356. QAPP GENERAL DEFICIENCIES: The EPA document Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/004, OSWER Directive 9355.3-01, 1988), hereafter EPA (1988), is referenced in the 300-FF-5 QAPP. EPA (1988) specifies content of QAPPs in Appendix B6. The 300-FF-5 QAPP is omits the required approval page required per EPA (1988) page B4, and is deficient in the content of the following sections:

Section 4.0 Sampling Procedures
Section 5.0 Chain of Custody and Field Documentation
Section 7.0 Analytical Procedures
Section 8.0 Data Reduction, Validation, and Reporting
Section 9.0 Internal Quality Control
Section 10.0 Performance and System Audits
Section 12.0 Procedures to Assess Data Quality

Response: Accept in part. The EPA-format required title page was inadvertently omitted in the editing process. It has been added to the current version.

The 300-FF-5 RI project work will be carried out in a consistent, controlled, safe, and high quality manner. To do this and to meet Tri-Party Agreement milestones, it is necessary to initially write work plans containing broad strategies for controlling activities such as quality assurance, health and safety, data management, project management and field sampling. This strategy has been followed for all six of the Hanford work plans written to date. As stated in these plans, all necessary and sufficient procedures, organizational responsibilities and controls will be in place before a contractor begins a specific task. Presently, Hanford DOE contractors are developing broad procedural requirements, as well as specific procedures, to control work activities. Contractors will then either use Hanford's existing procedures or will develop and have in place

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prior to starting work, procedures that will meet specific requirements. When these requirements and procedures are available, they can be referenced in the work plans. In the mean time, work plans are being written to general requirements.

357. QAPP GENERAL, Sec 1.3, 4.0, 5.1, 5.2 of the QAPP: These sections address procedures required to control RI/FS activities but do not cite any specific procedures nor do the sections clearly indicate if procedures are already developed and approved or await development and approval. Certain PNL procedures in place for groundwater investigations are insufficient for 300-FF-5 work, such as the Chain Of Custody procedure. This procedure applies to water samples only.

While the QAPP for the 300-FF-5 Operable Unit has been written following the basic categories of the EPA guidance documents, noted in the Introduction, it needs improvement in two regards: 1)it must address all of the topics called out in each of the 16 EPA categories, and 2)it must provided specific requirements and procedures. Environmental regulatory personnel expect a QAPP to address all of the requirements in each of the 16 categories. This document must treat and discuss each of those elements. The detail of the discussion must be specific. The regulatory agencies expect to be able to evaluate the adequacy of the control measures as described in the QAPP. It is generally not acceptable to provide QA requirements at a generic level -- the regulatory personnel want to see specific procedures.
IT

Response: Reject. The 300-FF-5 RI project work will be carried out in a consistent, controlled, safe, and high quality manner. To do this and to meet Tri-Party Agreement milestones, it is necessary to initially write work plans containing broad strategies for controlling activities such as quality assurance, health and safety, data management, project management and field sampling. This strategy has been followed for all six of the Hanford work plans written to date. As stated in these plans, all necessary and sufficient procedures, organizational responsibilities and controls will be in place before a contractor begins a specific task. Presently, Hanford DOE contractors are developing broad procedural requirements, as well as specific procedures, to control work activities. Contractors will then either use Hanford's existing procedures or will develop and have in place prior to starting work, procedures that will meet specific requirements. When these requirements and procedures are available, they can be referenced in the work plans. In the meantime, work plans are being written to general requirements.

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358. SAP/QAPP, GENERAL: While the control elements necessary to ensure the quality of the data are included in the plan, those control elements necessary to ensure control of the project are not invoked. DOE has invoked control elements (NQA-1) such as procurement control, shipping and handling, test control, document control, auditing (project management) to name a few that appear to be applicable. The plan seems to be addressing only the work to be controlled in the field and at the laboratories according to EPA requirement 005/80.

It should be recognized that the requirements for the applicable control elements necessary to ensure quality of the program/projects should be specified in appropriate program/project guidance. Such guidance should address the DOE control requirements (NQA-1) considered necessary for controlling the management of the remediation program and lower tier projects.

We recommend all appropriate NQA-1 based control elements that are determined necessary to ensure control of the project be specified in a program document and included in the project plan as appropriate. We recommend that the control elements of NQA-1 be evaluated for applicability and included as necessary. Additionally, the procedure(s) for implementing the invoked requirements should be prepared and provided for review.

The determination of readiness to begin work is not addressed. Project verification of readiness is an important control element and should be addressed. We recommend that the requirements for determining readiness be specified. We recommend that the verification requirements for readiness be addressed under the control element, problem prevention.

The sampling and analysis plan should be rewritten and include either the specific procedures to be used or a reference of the procedure. Because this information was not included, we could not provide any comments on this attachment.
HAZWRAP

Response: Reject. The PNL Quality Assurance Program as delineated in the PNL-MA-70 Quality Assurance Manual addresses all of the 18 Basic Requirements mandated by NQA-1. As such, procedures to control such factors as procurements, training, document control, test control, etc., are a routine part of the way the PNL does business.

However, as stated in response to comment 355, the level of detail in the QAPP was dictated by the WHC SOW and the 300-FF-1 format. Additionally, while EPA-HQ does have a controlled copy of the MA-70 Manual (EPA Region 10 has only uncontrolled copies), this does not mean

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that the document is "publicly available". Currently, only the policy section of the MA-70 manual has been cleared for public release. Since the procedures have not been cleared for release they can not be referenced in this QAPP. See also response to comment 357.

359. QAPP GENERAL: In the QAPP, the assumption is made that the RI/FS is going to be performed by PNL. This assumption, to date, has no basis. Therefore the following are examples of changes that are necessary. The QAPP should reference, by name and number, applicable WHC Environmental Investigation Instructions (EIIs), procedures, and Quality Assurance manuals. The reference to PNL Analytical Labs in Figure 2 should be changed to a vendor analytical lab. The reference to the PNL project manager in Section 7.0 should be changed. And in Section 11.0, approval authority should be within WHC.
IT

Response: Accept in part. Specific references to PNL have been deleted. References to WHC have been inserted. However, the level of detail in the QAPP, as in the rest of the Work Plan, was dictated by the WHC SOW and the 300-FF-1 format (see previous comments 353, 355, 356, 357, 358).

360. QAPP GENERAL: The following information must be placed in the upper right-hand corner of each page in the QAPP:
- section number
- revision number (0 is initial issuance, with subsequent revisions marked consecutively)
- date (of initial issuance or revision)
- page number

IT

Response: Accept. The page headers were inadvertently omitted during editing and will be included in the next version.

361. QAPP Title Page: The following elements must be provided in a title page:
- The specific title, revision, and language that identifies the document as the QAPP
- Places for signatures and dates of approval for the following:
  - -DOE Project Manager
  - -DOE QA Officer
  - -Contractor Project Manager
  - -Contractor QA Officer
  - -Subcontractor Project Manager (if subcontractor is used)
  - -Subcontractor QA Officer (if subcontractor is used)

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-Lead Agency Project Manager
-Lead Agency QA Officer
-Ancillary Agency Project Manager
-Ancillary Agency QA Officer
-Other appropriate individuals involved in the QA/QC of the project should also approve the plan (e.g., laboratory manager for the project.

IT, HAZWRAP

Response: Accept. The EPA-format required title/signature page was omitted during the editing process and will be placed in the next version of the QAPP.

362. QAPP Table of Contents: The following must be provided in a table of contents:

Introduction -- a brief discussion describing organization of the QAPP as presented in the Table of Contents
A serial listing of the contents of the QAPP, including any appendices necessary to support the QAPP
A listing at the end of the QAPP of all official recipients of the QAPP and its subsequent revisions.

Response: Accept. A general introduction and a listing of all official recipients of this QAPP will be placed in the next version of the QAPP. A serial listing of the Table of Contents and any Appendices is currently found in the QAPP.

363. SAP/QAPP-v, Table of Contents: The end of the Table of Contents does not include a list of recipients of official copies of the QAPP. (See reference EPA (1988), appendix B, section III.) We recommend that provisions be made to include the listing of recipients of the official QAPP (controlled copies).

HAZWRAP

Response: See response to comment 362.

364. SAP/QAPP-iii to v, Table of Contents: The Table of Contents does not indicate the inclusion of the programmatic quality assurance elements as described in NQA-1.

HAZWRAP

Response: Reject. The QAPP is formatted to the requirements of QAMS-005/80 (EPA-600/4-83-004) and the requirements of the WHC SOW and the 300-FF-1 QAPP. The inclusion of programmatic QA requirements does not follow the prescribed format. Reference to the additional sections of

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the QAPP (i.e., Sections 15, 16, 17 and 18) has been made in the introduction to the Table of Contents.

365. SAP/QAPP-1, Sec. 1.1, Para. 1: The project objectives should state in more detail what are the objectives. It should provide more information on site specific objectives.
IT

Response: Accept. Additional information will be provided in the next version of the QAPP.

366. SAP/QAPP-1, Sec. 1.1, Para. 1: The phase of this work and how it relates to the overall project must be discussed.
IT

Response: Accept in part. Additional information, or appropriate reference, will be included in the next version of the QAPP.

367. SAP/QAPP-1 ,Sec.1.2, Para. 1: The site chronology is referenced to the Project Plan, Chapter 2, which in turn references another Project Plan, 300-FF-1, which is not available. The site chronology must be in the Plan that relates to the project and the QAPP.
IT

Response: Accept in part. According to the WHC Statement of Work, the 300-FF-5 Work Plan is designed to be an addendum to the 300-FF-1 Work Plan and is not to be reproduced in total. A reference to site-specific information found in the 300-FF-1 Work Plan will be included in this section.

368. SAP/QAPP-1, Sec. 1.3, Para. 1: If Phase I data quality objectives are to be used they should be defined.
IT

Response: Reject. The use of "Phase I data quality objectives" here is intended to be a generic statement. Specific Data Quality Objectives (DQOs) for work to be performed are enumerated in Tables 2 and 3 of the QAPP.

369. SAP/QAPP-1, Sec. 1.3, Para. 2: It is not clear what an impact level is, how impact levels relate to any quality issues, and what their importance is to the QAPP. If these are to be addressed, they should be described.
IT

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Response: Accept. The references to Impact Levels in the QAPP have been removed to avoid confusion with other systems of graded quality assurance programs.

370. SAP/QAPP-1, Sec. 1.3, Para. 2: This paragraph must describe specific requirements if the items being addressed in this section are to be included.
IT

Response: Accept. In response to an earlier comment, this paragraph has been deleted from the QAPP.

371. SAP/QAPP-3, Sec.1.4, Para. 1: If requirements concerning review and update of the QAPP are to be addressed, they should be placed in a separate section dedicated to that activity, and include specifics as to schedule (absolute or frequency), personnel responsible for implementation, items to be reviewed, situations that require an update, procedure for update, appropriate personnel to receive updates, and methods for distributing and controlling the update revision.
IT

Response: Reject. The information is felt to be appropriate where placed. The QAPP will be changed to reflect a mandatory annual review. The QAPP format and level of detail are dictated by the WHC SOW and 300-FF-1 format.

372. SAP/QAPP-3, Sec. 1.4, Para. 1: The title of this section indicates that a schedule will be provided, but there is not one. If a schedule is to be provided, then it should include specific dates, or relative scheduling paths.
IT

Response: Accept. The title "Schedule of Activities" was taken from the 300-FF-1 QAPP to promote a standard between the two documents. To avoid confusion, the term "Schedule" will be changed to "Discussion".

373. SAP/QAPP-4, Sec. 1.0, Missing: There must be a physical description of the project area describing important physical features to the degree so that the QAPP can be reviewed.
IT

Response: Accept in part. A physical description is not felt to be necessary here, but a reference to Chapter 2 of the Work Plan will be made in Section 1.4.1.

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374. SAP/QAPP-4, Sec. 2.1, Para. 1: The organizational structure is not uniquely referenced and is not in the QAPP. It must be readily retrievable or in the QAPP.
IT, HAZWRAP

Response: Accept. Section 2.1 will be revised to include project organizational structure.

375. SAP/QAPP-4, Sec. 2.1, Para.1: If subcontractors are to be evaluated, the "standard administrative practices" should be described.
IT

Response: Reject. The requested information and level of detail are not appropriate for this section. In response to an earlier comment however, Section 2.1 will be revised.

376. SAP/QAPP-4, Sec. 2.1, Para. 1: If subcontractor plans are to be approved, the criteria for their approval should be noted.
IT

Response: Reject. See response to comment 375.

377. SAP/QAPP-4, Sec. 2.1, Para. 2: Criteria for approval of analytical procedures should be provided.
IT

Response: Reject. See response to comment 375. Additionally, specific criteria for approval of analytical procedures will be passed to the laboratory(s) via a Statement of Work (SOW).

378. SAP/QAPP-5, Sec. 2.2, Para. 1: The information (approved laboratory procedures, procurement, etc.) in this section should be deferred to those sections that address laboratory functions, and should provide specific information.
IT

Response: Reject. The information provided follows the contractually-specified format of the 300-FF-1 Work Plan. This section is intended to provide the reader with an understanding of the major facets of the control of the analytical laboratory(s). Specifics will be passed to the laboratory(s) via SOW.

379. SAP/QAPP-5, Sec.2.2, Para. 1: The organizational structure as it applies to the lab and this QAPP must be included.
IT

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Response: Reject. Section 2.1 will be revised to include the project organizational structure. Other than interrelationships, the organizational structure of a laboratory does not need to be reproduced here since it can be found in that organization's QA Plan.

380. SAP/QAPP-5, Sec. 2.3, Para. 1: The organizational structure for subcontractors must be provided.
IT

Response: Reject. Section 2.1 will be revised to include the project organizational structure. Other than interrelationships, the organizational structure of subcontractors does not need to be reproduced here since it can be found in those organization's QA Plans.

381. SAP/QAPP-5, Sec. 2.3, Para. 1: If procurement procedures are to by used, then specific requirements should be presented.
IT

Response: Reject. See response to comment 357.

382. SAP/QAPP-5, Sec. 2.3, Para. 1: If applicable quality requirements are to by used, then specific requirements should be presented.
IT

Response: Duplicate comment to 381.

383. SAP/QAPP-5: The mobile laboratories which meet the requirements of the last sentence of the first paragraph should be described.
NUS

Response: Reject. This statement merely summarizes all of the various possibilities available. When/if the use of a mobile laboratory is indicated, specific quality requirements will be developed and passed-on via SOW.

384. SAP/QAPP-5, Sec. 3.0, Para. 2.: Criteria for an "appropriately equipped" laboratory should be identified.
IT

Response: Reject. The use of the term "appropriately" here refers to appropriately equipped to perform the contracted analyses. The sentence will be revised.

Commentor Codes: IT = International Technology, RL = Richland Operations, HAZWRAP = DOE/HQ-DP contractor, NUS = DOE/HQ-E&H contractor, OCC = Office of Chief Council - RL,

385. SAP/QAPP-5, Sec. 3.0, Para. 2: Quality objectives should be established in the QAPP instead of the procurement documents (although the procurement documents should pass down quality requirements).
IT

Response: Reject. This section, excerpted from the 300-FF-1 QAPP, is intended to provide an overview of EPA Analytical Level III lab activities as they relate to this project and is not intended to generate specific quality requirements.

386. SAP/QAPP-7, Sec. 3.0, Para. 4: Requisite QC parameters are not specified -- quantitative limits for precision, accuracy, and method detection limits must be established in the QAPP.
IT

Response: Reject. Requisite QC parameters are, in fact, specified in Tables 2 and 3 as referenced in the subject paragraph.

387. SAP/QAPP-7 Section 3.0, Table 2: The level of accuracy and precision for depth to water during testing is not adequate for determination of hydrogeologic characteristics. Change accuracy and precision to +0.02 ft.
IT

Response: Reject. PNL field teams currently use 15 psig transducers to measure depth to water. These transducers have a resolution of ± 0.035 ft. Therefore, the precision and accuracy of the measurements taken cannot exceed this resolution. Table 2 will be modified to reflect ± 0.04 ft for both precision and accuracy.

388. SAP/QAPP-7, Table 2: Does not present Data Quality Objectives; the table should not be labeled thus.
NUS

Response: Reject. Table 2 does, in fact, list DQO's.

389. SAP/QAPP-8, Table 3: See comment above for WP-122, Table 28 regarding use of analytical levels.
IT

Response: Accept. The QAPP will be revised accordingly.

390. SAP/QAPP-10, Sec. 3.0, Para. 5: Specific detection limits must be addressed as required by other regulations to determine that they are low enough.
IT

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Response: Reject. The detection limits for various SW-846 and CLP analytical techniques are addressed in each specific technical procedure. In situations such as Special Analytical Samples (EPA Level V), the detection limits will be addressed via a Statement of Work or Work Order.

391. SAP/QAPP-10, Sec. 3.0, Para. 6: Completeness should be at the 90% level in keeping with EPA guidance.
IT

Response: Accept. In response to an earlier comment, the objective for completeness has been changed to 90%.

392. SAP/QAPP-10, Sec. 3.0, Para. 6: Representativeness must be addressed for laboratory functions.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 format. Several sections of the QAPP will, however, be expanded. References to specific procedures, and therefore discussions of specific methodologies, are not possible since many of the procedures are being, or have yet to be, developed. In addition, many procedures have not yet been cleared for public use.

393. SAP/QAPP-10, Sec. 3.0, Para. 6: Standard reporting techniques must be specified. Comparability must be discussed in specific terms to present the methodologies such that the data is usable with that from other project efforts.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 format. Several sections of the QAPP will, however, be expanded. References to specific procedures, and therefore discussions of specific methodologies, are not possible since many of the procedures are being, or have yet to be, developed. In addition, many procedures have not yet been cleared for public use.

394. SAP/QAPP-10, Sec. 3.0, Para. 6: Field methods must by discussed in terms of comparability.
IT

Response: Accept. Section 3.0 will be revised to include a reference to the common use of the WHC EIIs or other WHC-approved procedures to promote comparability.

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395. SAP/QAPP-10, Sec. 4.0: This section must provide specifics for sample collection such that the techniques, procedures, methods, equipment, supplies and other aspects can be evaluated. The following must be specified:

Procedures should be described in detail for sample collection, decontamination, and field parameter measurements. Site-wide procedures should be used wherever possible, but must be appended to the QAPP for use in review.

Guidelines or techniques should be provided on determining the number of samples and their location. A brief but complete discussion should be provided on specifically how the material is actually collected. Discussion should be specific enough that a knowledgeable individual can use the QAPP and ensure that each sample is collected in the same manner each time.

Requirements should be provided on preservation of sampled material including requisite containers, preservatives, transportation methods, and holding times. A table is a good format for presenting these type of information.

Specific forms that will be used to document the samples' history, field conditions, and other appropriate parameters shall be presented.

Charts, flow diagrams, or tables, representing the sampling program, must be presented.

IT

Response: Accept in part. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 format. Section 4.0 of the QAPP, Sampling Procedures, will be expanded however within those guidelines to include a matrix of the types of procedures to be utilized during each of the tasks to be conducted. References to specific procedures are not possible since many of the procedures are being, or have yet to be, developed. These are very good comments. Each will be addressed within a working level document to be generated by the subcontractor performing the work.

396. SAP/QAPP-10, Sec 4.0, The content of this section addresses procedure development, preparation, approval, and use but does not include that required by EPA (1988) on page B5 and B6 such as:

- o methods and guidelines used to select sampling sites
- o specific sampling procedures

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- o explanation of the sampling program
- o containers, procedures, reagents used for sample collection, transport, and storage
- o special conditions used to prepare sampling equipment and containers to avoid sample contamination
- o sample preservation methods
- o sample holding times
- o examples of chain of custody forms and procedures
- o description of forms, notebooks, and procedures used to record sample history, sampling conditions, and requested analyses.

IT

Response: Reject. See response to comment 395.

397. SAP/QAPP-10, Sec 4: Provide specific procedures to cover drilling, field screening, and installation.
IT

Response: Reject. See response to comment 395. In addition, QA requirements necessary to control drilling activities will be passed to the subcontractor via Statement of Work (SOW) or Work Order (WO).

398. SAP/QAPP, Section 4.0: This section requires procedures to be developed, prepared, and approved; however, the requirements and instructions for the development, preparation, and approval of these procedures has not been delineated or reference made to the appropriate procedure for this activity. We recommend that the requirements of Document Control and Instructions, Procedures, and Drawings of NQA-1 be evaluated and applied. Accordingly, a procedure should be established detailing the requirements and instructions for procedure preparation, review, and approval.
HAZWRAP

Response: Accept. Section 4 will be modified to include reference to the WHC procedures for procedure preparation, review, and approval.

399. SAP/QAPP-10, Sec. 4: The discussion of procedures should include a listing of those procedures enumerated in this work plan that are yet to be developed. This was an action item agreed upon between WHC and DOE.
IT

Response: Accept. Section 4 will be revised to include a matrix of procedures to be developed.

400. SAP/QAPP-10, Sec. 4.0, Para. 3: Change control procedures should be specified.

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IT

Response: Accept. Section 4 will be revised to include a change control and a reference to Section 15.4, which also discusses document control.

401. SAP/QAPP-10, Sec. 4.0, Para. 3: The Design Field Change form should be included and described.
IT

Response: Reject. The reference to this PNL form has been deleted.

402. SAP/QAPP-11, Sec 5.0, Include a chain of custody form and field sampling form, and specify the PNL procedure to be used, per EPA (1988) page B6. The PNL groundwater investigation procedure for chain of custody does not address soil, sediment, or other environmental media. If this procedure will be used for the RI/FS it must be amended to include these types of samples.
IT

Response: Accept. Section 5 will be revised to reflect the use of Chain-of-Custody forms and procedures per WHC guidelines. Additionally, Section 4 will be revised to include a matrix of applicable Sampling and Investigative procedures and Chain-of-Custody will be addressed.

403. SAP/QAPP-11, Sec. 5.1 & 5.2: These two sections refer to "appropriate PNL procedures". Those procedures must be specified and compliant with the following EPA requirements:

A standard Chain-of-Custody procedure should be described that includes the following:
- -conditions of custody for field, laboratory, and file situations
- -documentation of sample contact with reagents or sample collection supplies
- -preservation methods
- -methods for tracking of samples between field and laboratory.

An example of a Chain-of-Custody form should be provided that includes the following minimum requirements:
- -the sample number
- -the preservation method
- -container types
- -sample destination
- -a log for relinquishing and receiving samples.

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An example of a sample label shall be provided that allows for the following information:
-sample number
-description
-location
-matrix
-preservative
-date
-sampling personnel
-and other information important to the tracking of the sample to the laboratory.

Chain-of-Custody procedures for the laboratory should identify responsible personnel for receiving and logging in the sample into the laboratory system. Procedures should be described for appropriate sample tracking within the lab, and include sample laboratory numbering system, and other sample handling storage and processing procedures.

Flow diagrams can be a useful aid in exemplifying custody and the flow of the samples from the field through the analytical result to the final custody files.

IT, HAZWRAP

Response: Accept. Section 5 will be revised to reflect WHC guidelines and procedures. Additionally, the 300-FF-5 RI project work will be carried out in a consistent, controlled, safe, and high-quality manner. To do this and to meet Tri-Party Agreement milestones, it is necessary to initially write work plans containing broad strategies for controlling activities such as quality assurance, health and safety, data management, project management and field sampling. This strategy has been followed for all six of the Hanford work plans written to date. As stated in these plans, all necessary and sufficient procedures, organizational responsibilities and controls will be in place before a contractor begins a specific task. Presently, Hanford DOE contractors are developing broad procedural requirements, as well as specific procedures, to control work activities. Contractors will then either use Hanford's existing procedures or will develop and have in place prior to starting work, procedures that will meet specific requirements. When these requirements and procedures are available, they can be referenced in the work plans. In the mean time, work plans are being written to general requirements.

404. SAP/QAPP-11, Sec 6.0: All M&TE equipment used in support of FF-5 must be controlled not just that for which PNL is responsible.

RL

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Response: Accept. Section 6 will be revised to include all measuring and test equipment.

405. SAP/QAPP-11, Sec. 6.0, Para. 1: This section states that measurement and test equipment will be controlled in accordance with the calibration control system. That system must be specifically presented and address the following requirements:

A calibration procedure should be identified for each measurement and/or testing parameter for field and laboratory activities.

If standard operating procedures (SOP) or manufacturers manuals are to be utilized, these shall be referenced with any exceptions noted. These referenced documents should be included as appendices to the QAPP. If referenced material is not available then a detailed written calibration procedure shall be provided. This information shall be specific for each make and model of equipment.

The frequency of calibration shall be specifically noted.

For equipment that requires calibration standards, these shall be described including procedures for ensuring their traceability.
IT

Response: Accept. Section 6 will be revised. However, the level of detail of this QAPP is dictated by the constraints of the WHC SOW and the 300-FF-1 Work Plan format. See also the response to comment 403.

406. SAP/QAPP-11, Sec 7.0, List the methods of data collection to be used, and reference either a standard operating procedure or analytical procedure for each method, per EPA (1988) page B6. Table 3, provides little useful data on analytical method, minimum detection limits, precision or accuracy to justify its reference in this section.
IT

Response: Accept in part. Section 7 will be modified to include a reference to SW-846 analytical methods for the analytical level III analyses indicated in Table 3. The methods of data collection can be found in Table 4, a matrix of Sampling and Investigative Procedures.

407. SAP/QAPP-11, Sec. 7.0, Para. 1: Section 3.0 denotes method numbers for the analytes of interest, but section 7.0 then states that appropriate analytical methods and procedures shall be selected or developed and approved. This appears inconsistent. Specific SOPs must be referenced and provided, or analytical methods described that are EPA approved.

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IT

Response: Accept. See response to comment 406.

408. SAP/QAPP-11, Sec. 7.0, Para. 1: This section must address field analytical methods, referencing and providing SOPs; or provide a written description.
IT

Response: Accept. This section will be modified to include field as well as laboratory analytical methods.

409. SAP/QAPP-11, Sec. 7.0, Para. 2: Precision and accuracy must be presented.
IT

Response: Reject. As stated in paragraph 2 of Section 7, "Table 3 provides ... reference sources for method detection limits, precision, and accuracy as available, for each analyte of interest...

410. SAP/QAPP-11, Sec. 7.0, Para. 2: Statistical guidelines for evaluation of precision and accuracy must be presented (see section 14.0).
IT

Response: Accept. The statistical procedures used to assess precision and accuracy were deleted during the initial editing process. These formulae will be added and will be referenced here.

411. SAP/QAPP-11, Sec. 7.0, Para. 2: The QAPP (instead of negotiated SOWs) must provide the guidance for analytical and QC requirements for the laboratory .
IT

Response: Reject. At this time, the issue as to whether EPA Analytical Level III or IV will be used to perform the analyses is still unsettled and is the center of much discussion. Therefore, specific guidance cannot be determined at this time and cannot be included in the QAPP. Additionally, this paragraph is consistent with the guidance in the template for this QAPP, the 300-FF-1 Work Plan.

412. SAP/QAPP-11, Sec. 7.0, Para. 1-3: This section addresses topics that must be in chapters on objectives for measurement and methods for QC assessment (points 5 and 14 of the EPA 16 point requirements). To maintain consistency and proper organization this section should address only analytical procedures.

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IT

Response: Reject. The EPA's QAMS-005/80 is a guidance document only, as stated in the document title. Sections can be combined and expanded as needed. In addition, this section is consistent with the guidance in the template for this QAPP, the 300-FF-1 Work Plan.

413. SAP/QAPP-12, Sec 8.0, The section should be expanded to include data reduction schemes, and equations to calculate concentration or value of the measured parameter for all parameters, not just those for analytical chemistry (EPA, 1988, page B6).
IT

Response: Reject. At this time, contracts for analytical lab services have not been finalized and SOWs have not been generated. Additionally, the issue of whether EPA Analytical Level III or IV will be used to perform the analyses is still unsettled and is the center of much discussion. Therefore, specific guidance cannot be determined at this time and cannot be included in the QAPP. This paragraph is consistent with the guidance in the template for this QAPP, the 300-FF-1 Work Plan.

414. SAP/QAPP-12, Sec. 8.0, Para. 2: The equations that will be used to reduce the analytical data, including reporting units, must be presented .
IT

Response: Reject. Equations to be used for the reduction of analytical data are found in the specific EPA analytical method or technique for the analyte of interest and will not be repeated here. Sentence two of paragraph one states that the analytical lab will be responsible for examining and validating analytical results. In addition, reporting units (aka "standard units") can be found in Section 8.3.

415. SAP/QAPP-12, Sec. 8.0, Para. 1: This section must include an organizational structure that identifies key individuals or positions for receiving, documenting, analyzing, managing data, reporting, QC, and DOE contact for the analytical functions.
IT

Response: Reject. The necessary organizational structure is provided in the Project Management Plan, Appendix 3, and will not be reproduced here. A reference to the PMP will be added.

416. SAP/QAPP-12, Section 8.0 P. 1 & 2: The Analytical Laboratories can only validate the data to the extent that the analytical procedures were followed after receipt of the samples. It should be noted that all

analytical procedures could be followed and the resulting data still considered invalid if it cannot be demonstrated that field procedures were followed. We strongly recommend that the responsibility for data validation be extended to include the consideration of field activities and include the project team input.
HAZWRAP

Response: Accept. Paragraph 1 of Section 8.0 will be modified to reflect the responsibility of field team leaders for the preliminary examination and validity of data collected in the field.

417. SAP/QAPP-12, Sec. 8.1, Para. 1: The referenced Data Management Plan should address provide specifics on management of analytical data.
IT

Response: Agree. It is planned that the Hanford Environmental Information System (HEIS) will be the database used to manage analytical data. The specifics for control of HEIS have not been established yet. When HEIS has been fully developed, the management of analytical data will be of prime importance from a control standpoint.

418. SAP/QAPP-12, Sec. 8.2, Para. 1: Specifics must be described for how "suspect" data is discovered. A method following EPA guidance on validating data, identifying principle criteria and procedures to evaluate and rank the data, must be described.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. Suspect data can be discovered at any stage of the data review process, both in the field and in the laboratory. Specific method(s) for evaluating data are included in the analyte-specific laboratory procedure.

419. SAP/QAPP-12, Sec. 8.2, Para. 1: Methods shall be noted to identify and deal with outliers, i.e. those pieces of data that fail data validation criteria.
IT

Response: Accept. The recommended statistical procedures used to assess precision and accuracy were deleted during the initial editing process. These formulae will be added as Appendix A. Section 2.5 of Appendix A discusses outliers. Additionally, a reference will be made including outliers as "suspect data" to be investigated.

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420. SAP/QAPP-12, Sec. 8.2, Para. 1: The methods for documenting the investigative procedures into suspect date (outliers form the data validation process) must be described. This should include the procedures, personnel, and record keeping.
IT

Response: Accept in part. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures does not follow the format prescribed. Section 8.2, paragraph 1 will be modified to include distribution and inclusion into the permanent project files of all suspect data reports.

421. SAP/QAPP-12, Sec. 8.2, Para. 1: Examples and instructions for usage of the Deficiency Report and the Nonconformance Report should be included.
IT

Response: Reject. Deficiency and Nonconformance Reports are PNL-specific terms and will be deleted from this paragraph. This paragraph will be modified to reflect WHC or WHC-approved procedures for controlling deficiencies and nonconformances.

422. SAP/QAPP-12, Sec. 8.2, Para. 1: The Hanford Environmental Information System is not specifically addressed in the Data Management Plan such that the flagging of suspect data can be evaluated. The relationship between analytical results and a data management plan must be specified and the procedure for flagging described.
IT

Response: Agree. This will be done when HEIS has been fully developed and implemented. See response to comment 417.

423. SAP/QAPP-12, Sec 8.2: The definition of a nonconformance (NQA-1) states "A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminant." According to this definition, the ". . .noncompliance with an established procedure or requirement,. . ." described in this section is actually a nonconformance and should be documented and processed accordingly. We recommend defining a "deficiency" such that it is distinguishable from a nonconformance or delete the description concerning the use of a Deficiency Report. We recommend that the requirements of Control of Nonconforming Items in NQA-1 be evaluated and invoked.
HAZWRAP

Response: Reject. Deficiency and Nonconformance Reports are PNL-specific terms and will be deleted from this paragraph. This paragraph will be modified to reflect WHC or WHC-approved procedures for

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controlling deficiencies and nonconformances. Additionally, nonconformances and deficiencies are discussed further in Section 13.3.

424. SAP/QAPP-13, Figure 2: A number of procedural hoops are provided through which an external laboratory must jump, yet there are no equivalent hoops for the PNL laboratories. Please expand.
IT

Response: Accept. Good comment. Figure 2 was originally drawn to differentiate between internal and external labs. This figure will be modified to avoid confusing the reader.

425. SAP/QAPP-13, Sec. 8.0, Figure 2: The Data Flow Scheme must also show the flow before and after the laboratory functions.
IT

Response: Accept. This figure will be modified as discussed above and should alleviate this problem comment.

426. SAP/QAPP-14, Sec. 8.3, Para. 1: Reporting units (abbreviations) should be defined.
IT

Response: Reject. This section has been deleted due to a previous comment.

427. SAP/QAPP-14, Sec 9.0, Describe how QC information will be used to qualify the field data (EPA, 1988, page B6).
IT

Response: Accept. This section will be modified to include a definition of each of the QC sample types and a discussion of their use(s).

428. SAP/QAPP-14, Sec. 9.1, Para. 2: This paragraph refers to section 3 for some of the requirements for this section, but the necessary requirements are not specified in that section. This section should present specific information on the following quality control checks:

Surrogate and matrix spikes, and calibration and internal standards parameters must be addressed.

The manner of collection for all QC samples must be describe.

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The method of analysis should be described in detail or referenced in a SOP for each QC parameter.

The manner in which QC data will be used to qualify the data should be discussed and include equations and discussion on their relevance.
IT

Response: Accept. This section has been modified in response to a previous comment.

429. SAP/QAPP-14, Sec 9.1: What about quality control checks for level IV analyses?
RL

Response: Accept. Section 9.1 will be modified to include QC checks of Level IV analyses in accordance with CLP Protocols.

430. Section 9.1, Page SAP/QAPP-15, Table 4. - Trip blanks for VOA samples should be included.
IT

Response: Accept. This section will be modified to include a definition of each of the QC sample types and a discussion of their use(s). A Trip Blank is a specific type of Field Blank.

431. SAP/QAPP-15, Sec 10, General Comment: The impact levels of the various parts of the RI/FS should be specified since PNL uses impact levels to allocate QA resources, or self policing by compliance with Good Practices Standards (GPS) methods.

Performance audits, as defined by EPA (1988, page B6) must be included in the section. Also, the reference to impact level I is not useful since impact levels assigned to RI/FS tasks are not identified nor explained.

The description of performance and system audits should follow the Appendix B (III) page B-6 of EPA (1988).

Performance audits are defined by EPA as a means to determine the accuracy of the total measurement system or parts thereof.

System audits are defined as an evaluation of all components of the measurement system to determine their proper selection and use, including careful evaluation of field and laboratory QC procedures.
IT, HAZWRAP

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Response: Accept. Agree that the reference to Impact Levels is confusing. In response to a previous comment, this section has been modified to delete references to Impact Levels. In addition, the references to System and Performance audits has been modified to provide clarification.

432. SAP/QAPP-15, Sec. 10.0, Para. 1: The scope of documents that a systems audit can be performed against should be specific: "applicable PNL quality assurance project plans" is too general.
IT

Response: Accept. This section will be modified accordingly.

433. SAP/QAPP-15, Sec. 10.0, Para. 2: Performance audits must be addressed and comply with the following:

Provide a schedule or intervals for their performance for all measurement parameters.

Identify appropriate personnel responsible for the performance and reporting of the audit.
IT, HAZWRAP

Response: Accept. Section 10 will be modified to provide clarification of System and Performance audits.

434. SAP/QAPP-15, Sec. 10.0, Para. 2:, Audits should be referred to as "system" and "performance" audits to avoid confusion.
IT

Response: Accept. Section 10 will be modified to remove references to PNL and PNL procedures and to clarify the terminology.

435. SAP/QAPP-15, Sec. 10.0, Para. 2: The periodicity for the performance of system audits should be provided.
IT

Response: Accept. Section 10 will be modified accordingly.

436. SAP/QAPP-15, Sec. 10.0, Para. 2: The "standard quality assurance procedures and internal audit procedures" should be described in the QAPP.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific

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procedures does not follow the format prescribed. Section 10 will however, be modified to remove references to PNL and PNL procedures and to clarify additional points.

437. SAP/QAPP-15, Sec. 10.0, Para. 2: The procedures for qualifying QA personnel should be described.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures does not follow the format prescribed. Section 10 will however, be modified to remove references to PNL and PNL procedures and to clarify additional points.

438. SAP/QAPP-16, Sec. 10.0, Para. 4: The standard procedures for the performance of surveillance should be described.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures does not follow the format prescribed. Section 10 will, however, be modified to remove references to PNL and PNL procedures and to clarify additional points.

439. SAP/QAPP-16, Sec. 10.0, Para. 5: Section 13.0 (that is referenced for addressing corrective actions and nonconformances) should provide criteria for correction, documentation, appropriate personnel and documentation.
IT

Response: Accept in part. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures does not follow the format prescribed. Section 13 will, however, be modified to provide clarification.

440. SAP/QAPP-16, Sec. 11.0, Para. 1&2: Procedures for preventative maintenance of field and laboratory equipment must be described. Owners manuals may be referenced for field equipment.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures, while suggested by the EPA guidance document (QAMS-005/80), does not follow the format prescribed. Section 11 will, however, be modified to remove references to PNL and PNL procedures and to clarify additional points.

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441. SAP/QAPP-16, Sec. 11.0, Para. 1&2: The preventative maintenance schedule for the laboratory and field equipment must be presented in the QAPP.
IT

Response: Reject. See response to comment 440.

442. SAP/QAPP-16, Sec 12.0: The section must include the frequency by which data will be evaluated for precision and accuracy, and the specific methods or techniques to be used (EPA 1988, page B6). The EPA requires routine assessment of data accuracy and precision, and this assessment is to be applied to all environmental monitoring and measurement data, not just analytical laboratory data.
IT

Response: Accept in part. Section 12.0 will be modified to specify a minimum frequency by which analytical data will be evaluated.

443. SAP/QAPP-16, Sec. 12.0, Para. 1: The specific procedures to evaluate precision, accuracy, and completeness must be presented.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures, while suggested by the EPA guidance documents (QAMS-005/80 and EPA/540/G-59/004), do not follow the format prescribed and are guidance documents. Section 12 will, however, be modified to clarify additional points.

444. SAP/QAPP-16, Sec. 12.0, Para. 1: Statistical equations used in the analyses to access data QC must be presented.
IT

Response: Accept. Section 12 will be modified to refer to the statistical formulae to be added as Appendix A.

445. SAP/QAPP-17 to 19, Sec 13 and 15, General Comment: Many references are made to quality assurance controls applied via "standard procedure(s)" the specific procedures should be identified.
IT

Response: Reject. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. The inclusion of specific procedures, while suggested by the EPA guidance documents (QAMS-005/80

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and EPA/540/G-59/004), do not follow the format prescribed and are guidance documents.

446. SAP/QAPP-17, Sec. 13.0, Para. 1: A line of communication needs to be established that details how the project manager or cognizant task leader are informed of items that need corrective action.
IT

Response: Accept. Section 13.0 will be modified to require that the Technical Lead and cognizant Task Leader be notified of the need for corrective actions.

447. SAP/QAPP-17, Sec. 13.0, Para. 1: The way of identifying the responsible person for initiating corrective actions must be exact so that there is no confusion as to who is responsible.
IT

Response: Accept. Section 13.0 will be modified as noted above. The Technical Lead is ultimately responsible for all corrective actions.

448. SAP/QAPP-17, Sec. 13.0, Para. 1: The person (title) responsible for approving the corrective actions must be identified.
IT

Response: Accept in part. Section 13.1 will be modified to invoke WHC or WHC-approved procedures for handling calibration discrepancies. These procedures contain the protocol for resolving/approving corrective actions.

449. SAP/QAPP-17, Sec. 13.0, Para. 1: Detailed generic procedures must be presented for implementing corrective actions.
IT

Response: Accept in part. See the response to comment 448.

450. SAP/QAPP-17, Sec 13.0: This section does not cover the aspect of corrective action concerning preventing recurrence. We recommend that the actions taken to prevent recurrence be discussed and provisions made for their documentation, review, and concurrence. The quality aspect should also include follow up to verify that the actions taken are being implemented and are effective.
HAZWRAP

Response: Accept. Section 13 will be modified to invoke WHC or WHC-approved procedures for handling nonconformances and deficiencies.

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These procedures contain the protocols for resolving/approving corrective actions, for the prevention of recurrences, and for the followup verification of corrective actions.

451. SAP/QAPP-17, Sec. 13.1, Para. 1: Limits for data acceptability need to be defined or referenced such that it is known when corrective action is required.
IT

Response: Accept in part. The level of detail in the QAPP is dictated by the WHC SOW and the 300-FF-1 Work Plan format. While specific limits of operating ranges are not appropriate here, the procedure which controls Measuring & Test Equipment will be referenced.

452. SAP/QAPP-17, Sec. 13.1, Para. 1: The calibration control system should be identified and address how the "calibration discrepancy" is implemented and resolved.
IT

Response: Reject. Calibration control system is discussed in Section 6.

453. SAP/QAPP-17, Sec. 13.2, Para. 1: The Deficiency Report should be presented with instructions on completion and disposition.
IT

Response: Reject. In response to a previous comment, Section 13.2 has been modified to delete the reference to the PNL Deficiency Report.

454. SAP/QAPP-17, Sec. 13.2, Para. 2: The reference in Chapter 4.0 on deviations from planned sampling procedures should provide specific information.
IT

Response: Reject. In response to a previous comment, this section has been modified to delete this section.

455. SAP/QAPP-17, Sec. 13.3, Para. 2: The Deficiency Report should be presented with instructions on completion and disposition.
IT

Response: Reject. See the response to comment 453.

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456. SAP/QAPP-17, Sec. 13.3, Para. 3: The reference in Chapter 4.0 on deviations from planned sampling procedures should provide specific information.
IT

Response: Reject. See the response to comment 454.

457. SAP/QAPP-18, Sec. 13.4, Para. 1: The Corrective Action Request should be presented with discussion on its implementation and completion.
IT

Response: Reject. Section 13.4 will be deleted. This information is discussed in the modification to Sections 10 and 13.3.

458. SAP/QAPP-18, Sec 13.4: The use of a Corrective Action Request is required for significant conditions adverse to quality; however, a representation of this form is not provided nor reference made to the procedure that would initiate this form. We recommend that a representation of the form be provided and reference made to the specific procedure used for this activity.
HAZWRAP

Response: Reject. See the response to comment 457.

459. SAP/QAPP-18, Sec. 15.0, Para. 1: The specific amount of time for record retention required under RCRA or CERCLA, as appropriate, should be specified.
IT

Response: Accept. Section 15 will be modified to provide records retention times.

460. SAP/QAPP-18 and 19, Sec 15.0: These provisions stated in the QA Records section of NQA-1 are not covered in this section. We recommend that the above named section of NQA-1 be evaluated and the applicable portions invoked and stated in this section of the QAPP.
HAZWRAP

Response: Accept in part. Section 15.1 will be modified to reference the applicable WHC or WHC-approved records system procedure. The WHC records system conforms to NQA-1 specifications. Specific applicable portions of NQA-1 will not be listed here since such specificity does not fit the required format as prescribed by the WHC-SOW and the 300-FF-1 Work Plan.

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461. SAP/QAPP-18, Sec. 15.1, Para. 1: The records system procedure should be described.
IT, HAZWRAP

Response: Reject. See the response to comment 460.

462. SAP/QAPP-19, Sec. 15.3, Para.1: The standard document control procedures should be described.
IT

Response: Reject. See the response to comment 460.

463. SAP/QAPP-19, Sec. 15.4, Para. 1: The standard procedures and instructions for change control and change request should be described.
IT

Response: Accept in part. In response to an earlier comment, this section has been modified to reference the WHC or WHC-approved procedure for technical procedure change control.

464. SAP/QAPP-19, Sec. 16.1, Para. 1: Procedures for procurement approval should be described.
IT, HAZWRAP

Response: Accept in part. In response to an earlier comment, this procedure has been modified to reference the WHC or WHC-approved procedures for controlling procurements.

465. SAP/QAPP-19, Sec 16.1: Since impact level II work is discussed, an explanation of the impact level system or a citation to provide the information on impact levels should be given.
IT

Response: Reject. In response to an earlier comment, the references to the PNL Impact Level system have been deleted.

466. SAP/QAPP-20, Sec 17.0: The procedure(s) for training, documentation of training, and evaluation of training needs has not been specifically named and has not been provided for review. We recommend that the procedures be specifically called out and provided for review.
HAZWRAP

Response: Accept in part. In response to an earlier comment, this section has been modified to include a reference to the training and indoctrination procedure(s).

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467. SAP/QAPP-19, Sec. 16.2, Para. 1: Procedures should be provided for procurement outside of the project organization.
IT, NUS

Response: Accept. Section 16.2 will be modified to reference the WHC or WHC-approved procedure(s) for controlling procurements outside the project organization.

468. SAP/QAPP-20 and 21, Sec 17.0: This section does not provide for requirements concerning control of software utilized by laboratories and other subcontractors and the specification of these requirements in procurement documents. We recommend that the requirements for control of software to be imposed on laboratories and subcontractors be delineated here.
HAZWRAP

Response: Accept. Excellent comment. Section 18 will be modified to include field and laboratory software, and a discussion of subcontractor software.

469. SAP/QAPP-20, Sec. 18.0, Para. 1: The software control procedures should be specifically described.
IT, HAZWRAP

Response: Reject. While Section 18 has been modified to provide clarification and to reference the use of WHC or WHC-approved procedures, the level of detail for the QAPP is dictated by the WHC SOW and the 300-FF-1 format.

470. SAP/QAPP-21, Sec 19.0: This section does not include the reference to DOE-RL, 1983, Quality Assurance, DOE Order 5700.1A, U.S. Department of Energy, Richland Operations Office, Richland, Washington; however, it would appear that this is a relevant document. We recommend that the above reference be included and the use of the NQA-1 document be invoked.
HAZWRAP

Response: Reject. While it is understood that Hanford contractors live under DOE Order 5700.1A and NQA-1, these documents were not referenced in the text of the QAPP. Therefore it is editorially incorrect to add unsolicited references to this section.

471. SAP/QAPP-21, Sec 18.1, Sent 1-3: Impact level II and III are referred to but no reference is provided to indicate what standards of QA or QC correspond to these levels. A reference or explanation of the different impact levels should be provided.
IT

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Response: Reject. In response to an earlier comment, the references to the PNL Impact Level system have been deleted.

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472. HASP-1, Sec 1.1, P. 1, last Sentence: Suggest the term "toxic" be changed to hazardous.
IT

Response: Accept. The suggested work change will be made.

473. HASP-1, Sec 1.4: Refers to 300-FF-1 health and safety plan for OSHA required training for hazardous waste operations workers. The 300-FF-1 plan does not include the requirement that trained workers be certified. OSHA in 29 CFR 1910.120 requires 3 days of field experience that is directly supervised by an experienced supervisor as required initial training for new site workers. The 300-FF-1 HASP states that new workers will be accompanied by an experienced worker for three days. Since the 300-FF-1 does not agree with the OSHA requirements the 300-FF-5 should be revised to correct the error.
IT

Response: Reject. The comment is being made to an oversight in the 300-FF-1 HASP which is being referenced. Therefore, it should be corrected in that document to prevent a conflict between the two HASPs. The comment will be forwarded to WHC for incorporation in the 300-FF-1 HASP.

474. HASP-1, Sec 1.4: Suggest that the training required for SCUBA diving, presented in Section 4.3.9, be referenced or moved to Section 1.4.
IT

Response: Accept. Specific training requirements for divers will be referenced in Section 1.4.

475. HASP-6: Should identify the respiratory protection that will be provided.
NUS

Response: Accept. The type of respiratory protection will be identified.

476. HASP-7, Sec 4.3.2, P. 5: The borings and wells where the described circumstances may occur should be listed in this plan.
IT

Response: Reject. It is assumed that all soil samples from drilling may contain a high level of contaminants until monitoring indicates otherwise. Therefore, respiratory protection is required at all sites and a listing of specific sites is not required.

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477. HASP-7, Sec. 4.3.3: The level of noise at which hearing protection will be required should be noted.
IT

Response: Accept. The noise level at which hearing protection will be required varies with the duration of daily exposure. However, for the HASP, an action level of 85 dBA will be set.

478. HASP-8, Sec. 4.3.5, P. 3: Under an RI/FS program, no one is allowed to wear contact lenses as they are specifically excluded under 29CFR1910.
IT

Response: Partially accept. The only statement regarding the use of contact lenses in OSHA is found in 29CFR1910.134(e)(5)(ii) which states: "Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed." This guidance will be included in the text.

479. HASP-9, Sec 4.3.8, P. 1: An emergency plan is called out, that plan should be a part of this Work Plan and HASP.
IT

Response: Reject. The 300-FF-1 HASP which contains the emergency plan is referenced and supplemented in this HASP. The 300-FF-1 HASP will be attached to this HASP since the 300-FF-5 HASP was written as a supplement to that plan.

480. HASP-9: Should describe what workers are to do when the outdoor temperature drops below 20°F.
NUS

Response: Reject. There is no specific action required when temperatures drop below 20°F other than avoiding skin contact with cold surfaces which is mentioned.

481. HASP-9: Should identify the potential combustible materials that might be used in the controlled area.
NUS

Response: Accept. The primary combustible material of concern at drill sites may be dry vegetation such as tumbleweeds that have been blown into the controlled zone. However, the requirement to minimize the combustible materials in the controlled area is necessary to minimize fire loading in the work area from accumulations of decontamination materials, sample materials, etc. This information will be added.

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482. HASP-12, Sec. 4.3.9, bullets: The noted safety procedures should be appended to this plan.
IT

Response: Reject. This is a health and safety plan--not an operation-specific safety procedure. The level of detail in the plan provides sufficient information to develop procedures for the required diving tasks.

483. HASP-12, Sec. 9: Maps of how to reach the emergency facilities is a required part of any HASP, please provide.
IT

Response: Reject. A map showing the location of emergency medical facilities is provided in the 300-FF-1 HASP which will be attached to this HASP.

484. HASP/APP-A, Attach-2: Why is MSDS provided for MEK (which was supposedly addressed in the 300-FF-1 Plan)? Why weren't MSDS provided for potential contaminants (other than MIBK) unique to the 300-FF-5 area (methanol, PCBs, solvent-refined coal, and Pm147; listed on page WP-59). Presumably, MSDSs were provided in 300-FF-1 work plan for all other constituents.
NUS

Response: Reject. MSDS's for MEK and MIBK were provided since Hexone was the only significant contaminant from the other operable units that had not already been mentioned in the 300-FF-1 HASP. MSDS information on the significant contaminants in the 300-FF-1 operable unit must be provided in the 300-FF-1 HASP which this plan supplements. This comment will be forwarded to WHC to ensure that the necessary MSDS information if provided.

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485. PMP: Management activities specific to the 300-FF-5 area should be addressed here.
NUS

Response: There are no project management activities unique to 300-FF-5 that are not already addressed by the Project Management Plan for 300-FF-1.

486. DMP-2: Procedures will be modified, used or developed to address records management for "discovery". Please explain what "discovery" is, and what information/documents are encompassed.
NUS

Response: Agree. It was meant to include data collected as part of RIs and FSs, but these are more specifically addressed by the following bullet. "Discovery" will be deleted.

487. DMP-3: It is not clear whether the original data sources will be retained. If not all data will be retained, what determines what will be kept?
NUS

Response: This is addressed in as much detail as currently available on page DMP-4, paragraph 4.

488. DMP-3, Figure 1: Would be interesting to know how artificial intelligence will be incorporated into a "User Interface".
NUS

Response: The exact nature of this subject is not well developed at this time, but two examples are "Natural Language Query" and expert systems.

489. DMP-9: A brief discussion of the format that databases can present data in would be helpful.
NUS

Response: Databases only store data. The peripheral software and hardware is what enables the data to be presented. Typical presentation formats include printed text and tables, graphics, and digital images (photos). GIS capability is also planned.

490. Community Relations Plan: The community relations plan should be reviewed before incorporation into the final RI/FS work plan.
NUS

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Response: Agree. The CRP has already been issued and will be referenced in the report. This is a Hanford-wide plan and will cover all CERCLA activities.

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